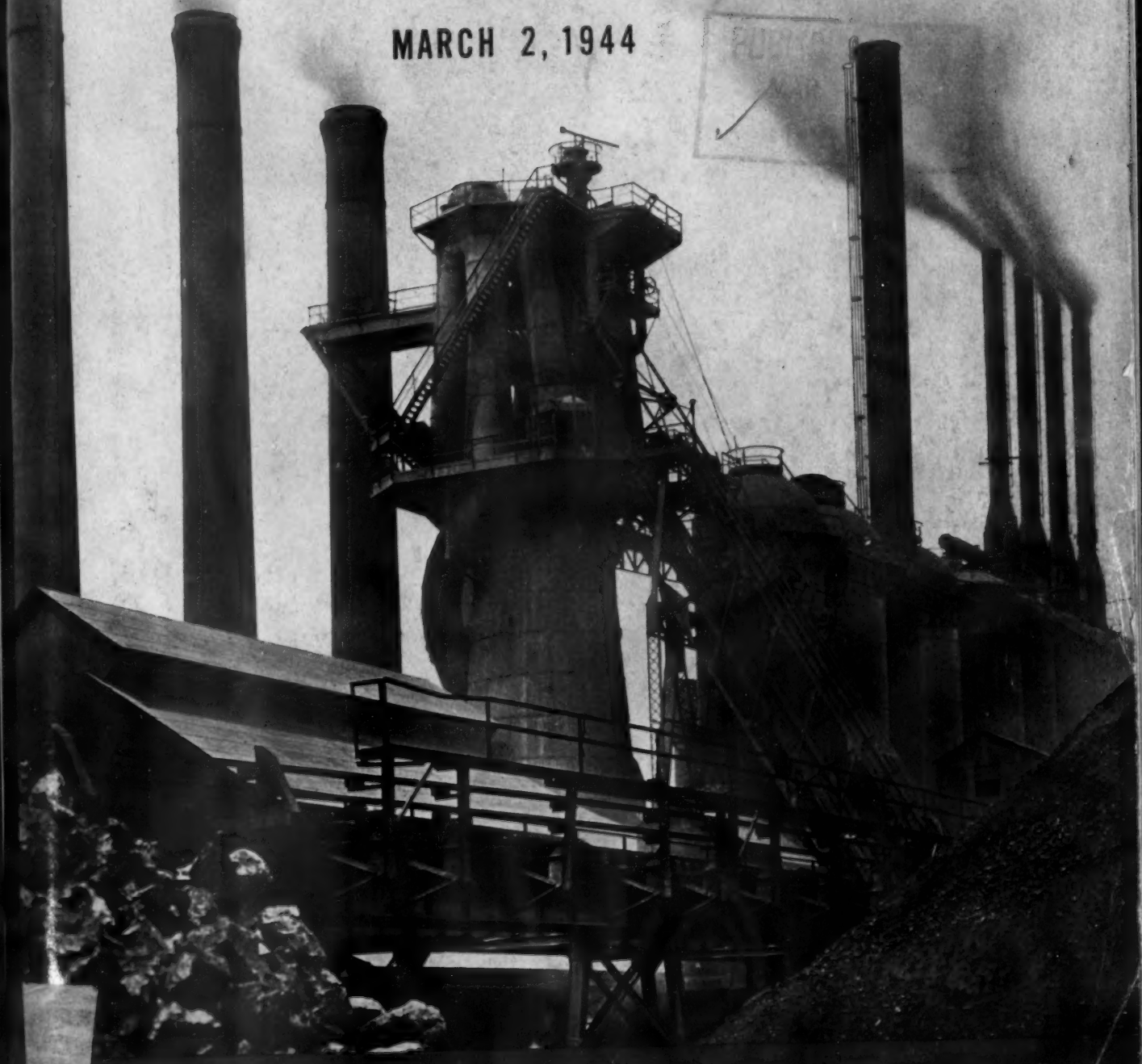
CHNOLOGY DEPT.

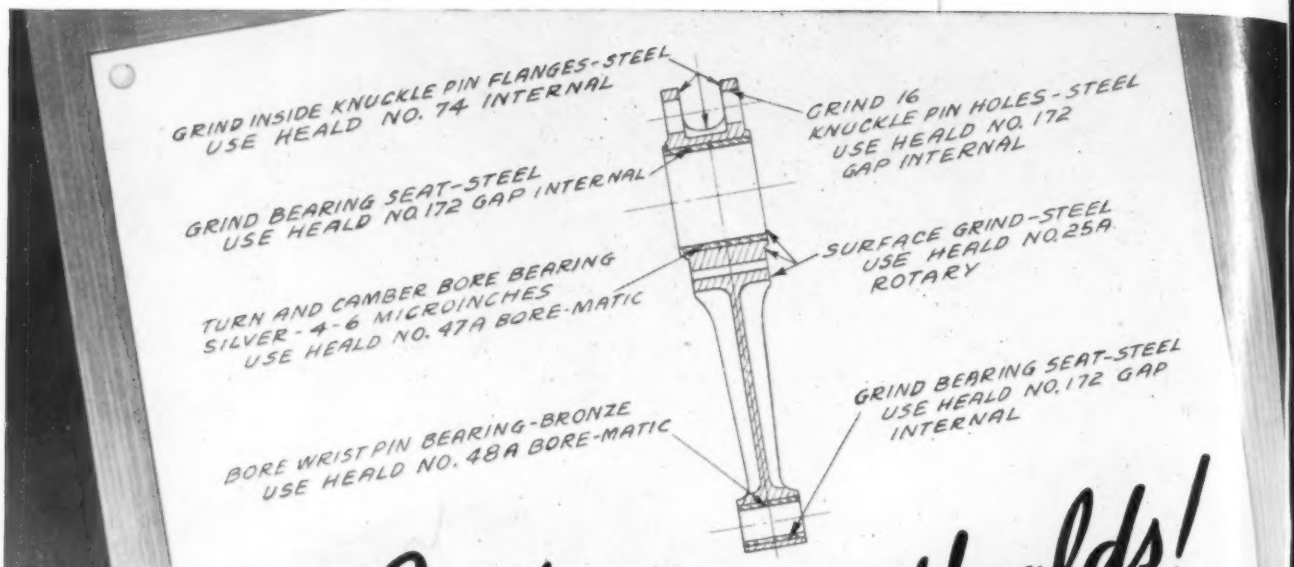
AMERICAN MACHINIST

MARCH 2, 1944



Use of NE Steels to Continue After the War—Page 83

R v.88 Mr-Ap 1944


GRIND INSIDE KNUCKLE PIN FLANGES - STEEL
USE HEALD NO. 74 INTERNAL
GRIND BEARING SEAT - STEEL
USE HEALD NO. 172 GAP INTERNAL
TURN AND CAMBER BORE BEARING
SILVER - 4 - 6 MICROINCHES
USE HEALD NO. 47A BORE-MATIC
BORE WRIST PIN BEARING - BRONZE
USE HEALD NO. 48A BORE-MATIC
GRIND 16
KNUCKLE PIN HOLES - STEEL
USE HEALD NO. 172
GAP INTERNAL
SURFACE GRIND - STEEL
USE HEALD NO. 25A
ROTARY
GRIND BEARING SEAT - STEEL
USE HEALD NO. 172 GAP
INTERNAL

32 Operations Do them all on Healds!

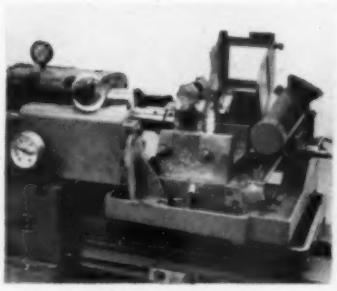
32 Surfaces . . . Just two processes . . . borizing and grinding. Illustrative of these operations done on Heald Bore-Matics and Grinding Machines are those shown below.

Practically every working surface on this aircraft master rod is finished on Heald Precision Finishing Machines — all of the 32 surfaces indicated in the sketch above, in steel, bronze and silver.

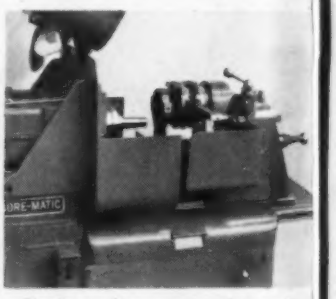
All these 32 surfaces are finished by just two processes — *borizing* and *grinding*. These are the accepted methods for final finishing every type of surface — every kind of material — when ultra precision of dimension and surface are required. In some instances either method can be used. In other cases one of the two will produce materially better results.

Heald builds *both* precision borizing and precision grinding machines . . . consequently we can recommend, without bias, the machine that will best meet your requirements. Precision plus production will play an important role in postwar manufacturing . . . let us help you get both with the *right* machine for the job.

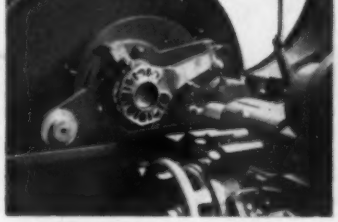
THE HEALD MACHINE CO., Worcester 6, Mass.



Contour boring silver master rod bearing on Heald No. 47A Bore-Matic.



Boring bronze wrist pin bearing in master rod on Heald No. 48A Bore-Matic.



Internal grinding 16 knuckle pin holes in master rod on Heald No. 172 Gap Internal.

Surface grinding shoulders and faces on master rod on Heald No. 25A Rotary.

HEALD PRECISION FINISHING MACHINES

Borizing - Internal Grinding - Surface Grinding

Tech

TECHNOLOGY DEPT.

American Machinist

March 2, 1944

BURNHAM FINNEY — Editor and Publisher
W. E. KENNEDY — General Manager
JOHN HAYDOCK — Managing Editor

•

WILLIAM J. HARGEST — Associate Editor
RUPERT LE GRAND — Associate Editor
BEN C. BROSHEER — Associate Editor
E. J. STRICKLAND — Pacific Coast Editor
MILTON H. GLOVER — Art Director
LAURANCE C. MESSICK — News Editor
THEODORE C. DU MOND — Assistant Editor
E. C. HAINES — Assistant Editor

•

PAUL WOOTON — Chief, Washington Bureau
BENJAMIN W. CORRADO — Washington
FRED H. COLVIN — Editor Emeritus
KENNETH H. CONDIT — Consulting Editor

District Managers: F. S. Weatherby, Boston; J. A. McGraw, New York; B. M. Hilberts, Philadelphia; Ray Deen, Chicago; P. F. Pritchard, Chicago; John Koch, Cleveland; R. H. Anderson, Cincinnati; T. A. Rogers, Detroit.

McGraw-Hill Publishing Company, Inc.

James H. McGraw, Founder and Honorary Chairman; James H. McGraw, Jr., President; Howard Ehrlich, Executive Vice President; Mason Britton, Vice President; Curtis W. McGraw, Vice President and Treasurer; Joseph A. Gerardi, Secretary; J. E. Blackburn, Jr., Director of Circulation, 330 West 42nd Street, New York 18, N. Y. Branch offices: Chicago, 520 North Michigan Ave.; San Francisco, 68 Post Street; Los Angeles, 601 W. Fifth Street; Aldwych House, Aldwych, London, W. C. 2; Washington; Philadelphia; Cleveland; Detroit; St. Louis; Boston; Atlanta.

RETURN POSTAGE GUARANTEED

VOLUME 88 — NUMBER 5

AMERICAN MACHINIST. Copyright 1944 by McGraw-Hill Publishing Co., Inc. Published every other Thursday, price 35c a copy. Allow ten days for change of address. Subscription rates—United States, Mexico and Central and South American countries, $5 a year, $8 for two years, $10 for three years. Canada, $5.50 a year, $9 for two years, $11 for three years. All other countries $8 a year, $13 for two years, $16 for three years. Entered as second class matter, August 13, 1943, at Post Office, New York, N. Y., under the act of March 3, 1879. Printed in U.S.A. Cable address, "McGraw-Hill, New York." Member of A.B.P. Member of A.B.C.

A McGRAW-HILL PUBLICATION

PRINTED IN U. S. A.

MAJOR ARTICLES

Use of NE Steels to Continue After the War ..... *C. M. Parker* 83
Tips Added to Coated Electrodes Reduce Welding Costs 87
The "Know-How" of Drawing Aluminum 88
Fixtures Increase Furnace Loads ..... *E. C. Prior* 90
War Producer Selects "Lost Wax" Casting Process .... *W. E. Ruder* 94
Industrial Training Speeds Rehabilitation 97

ARMAMENT SECTION

Interchangeabilty Aids Production of Lancaster Bombers 105

SHORT ARTICLES

Red-hot Milling Chips 96

PRACTICAL IDEAS

Handwheel Spokes Burred on the Drill Press ..... *E. C. Lorentz* 99
Expanding Arbor Cuts Lathe Set-Up Time ..... *F. Server* 100
Grease Gun Adapted for Oiling Lathe Centers ..... *Erman Souter* 100
Gage Sets Flame-Cutting Torches Quickly ..... *Harry Schoenhaut* 101
Thumb Jack Supports Long Work for Milling .... *R. S. Bustamante* 101
Spotfacing Tool Reaches Offset Holes ..... *G. F. Bernadt* 102
Angle Gages Check Accuracy of Pipe Bends ..... *W. P. Watts* 102
Washer Prevents Collets from Collecting Chips .... *Oscar M. Stiegler* 103
Adaptors for Riveter Eliminate Hand Work ..... *Ray M. Williams* 103
Limit Gage Has Wide Range of Settings ..... *Louis deL. Berg* 104

NEWS OF THE INDUSTRY

Gaging Business 124b
Inside Detroit 124e
Wartime Washington 124g
Spotting the Air News 124i
Names in the News 124k
Obituaries 124l

DEPARTMENTS

What's in This Issue 81
Reference Book Sheet 121
Editorial 124a
Shop Equipment News 125
Parts and Materials 136
Trade Publications 142

CHANGE OF ADDRESS

McGRAW-HILL PUBLISHING COMPANY, 330 West 42 Street, New York 18, N. Y.
Director of Circulation: Please change my address on American Machinist

From _____

_____

To _____

_____

Signed _____

AMERICAN MACHINIST —chips

Coming Attractions . . . We believe you'll be interested in a new series of special sections featuring Small Tools which starts in the next—or March 16—issue of *American Machinist.*

This first one will be on Milling Cutters and will discuss their proper selection, use and care.

Perhaps we'd better point out that these new sections will differ from the famous "Tools of Our Trade" series in that they will *not* be written primarily for use in training green employees. They will be very educational but are intended to be more advanced and of practical help to the experienced shop man.

It won't be necessary to tear this Small Tool section out of your copy of *American Machinist* as it will be available shortly in reprint form . . . probably at the usual "to-cover-the-cost-of-printing" price of 10c. We suggest you place your orders promptly as we may be able to print only a limited quantity.

o

19th Century Gag . . . *An unknown wit commented thus in the November, 1879, issue of* American Machinist: *"The longest felt want of this mechanical age is a machine that will either supersede the use of kerosene in lighting fires or utilize the remains of the household help who are charred at the post of duty."*

o

Jeepers Creepers . . . We have been watching with some confusion the long-standing controversy over who originated America's renowned "Jeep." Minneapolis-Moline, American Bantam, Willys and Ford all have their hats in the ring. The Quartermaster General's office of the War Department says "Credit for the origin of the Jeep design cannot be claimed by any single industry or manufacturer."

Regardless of who was the early bird, the fact remains that the Jeep is one of the finest fighting machines ever turned out of Metal-Working plants. And probably most of the credit should go to the guys who are using them so courageously at the other end of the line.

o

War Billions . . . *The Department of Commerce announced recently that the value of manufacturers' shipments designed for war use last year was $90,000,000,000 . . . slightly more than 3/5 of the total deliveries of $147,000,000,000. Hm-m-m.*

o

Post-War Color . . . Paint manufacturers will follow the rainbow and no doubt find a pot of gold if they are correct in forecasting color harmony in brilliant hues to enhance commercial and industrial equipment made after the war. This sounds swell to us . . . just so they don't ask machine operators to wear smocks and berets.

o

Plastics Entry . . . *The National Screw Machine Products Association, according to a forecast by Orrin B. Werntz, Executive Secretary, expects the screw machine industry not only to greatly expand after the war, but to go aggressively into the machining of plastics in bar form.*

In their trips around the country, American Machinist *editors have seen more and more Metal-Working shops engaging in the fabrication of plastics as well as metal . . . a very natural and very promising development.*

o

Wanted: Your Problems . . . Speaking of field contact, for some time now we have had men calling on Metal-Working plants to discuss first-hand some of the production trials and tribulations of our readers.

We want to take this opportunity of thanking those of you who have courteously extended interviews to these men, and we assure you that the information so obtained is of great help to us in guiding our editorial service.

As a specific case, the special section on Milling Cutters referred to in the first item on this page was a direct result of repeated requests from shop men for more help on milling problems. Other complaints made again and again concern the difficulties of working with alloy steels . . . and this, you may be sure, will receive the full attention of our staff.

May we remind you that if you have any definite production problems at this time we want to hear about them . . . and if possible give you some help. It isn't necessary to wait for a man to call on you . . . send in your problems or ideas to *Chips* and we'll see that it gets the proper attention. This is your column and letters from readers are always welcome.

o

Swell Booklet . . . *McCord Radiator & Mfg. Co. got out not long ago "The Story of the New American Helmet" . . . a now-it-can-be-told tale giving an interesting picture of the manufacture and usage of the Army's World War II headgear. Well worth reading.*

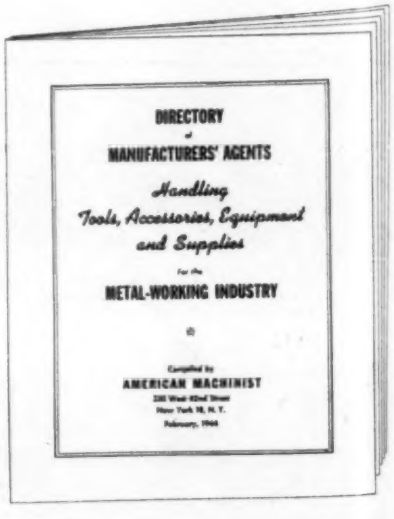
o

Another New Directory . . . This seems to be open season on lists, as we happily announce that a new and revised "Directory of Manufacturers' Agents" is now on the press. The printing and paper situation being what it is, we can't give you an exact date of completion, but by the time you read this the job should be done.

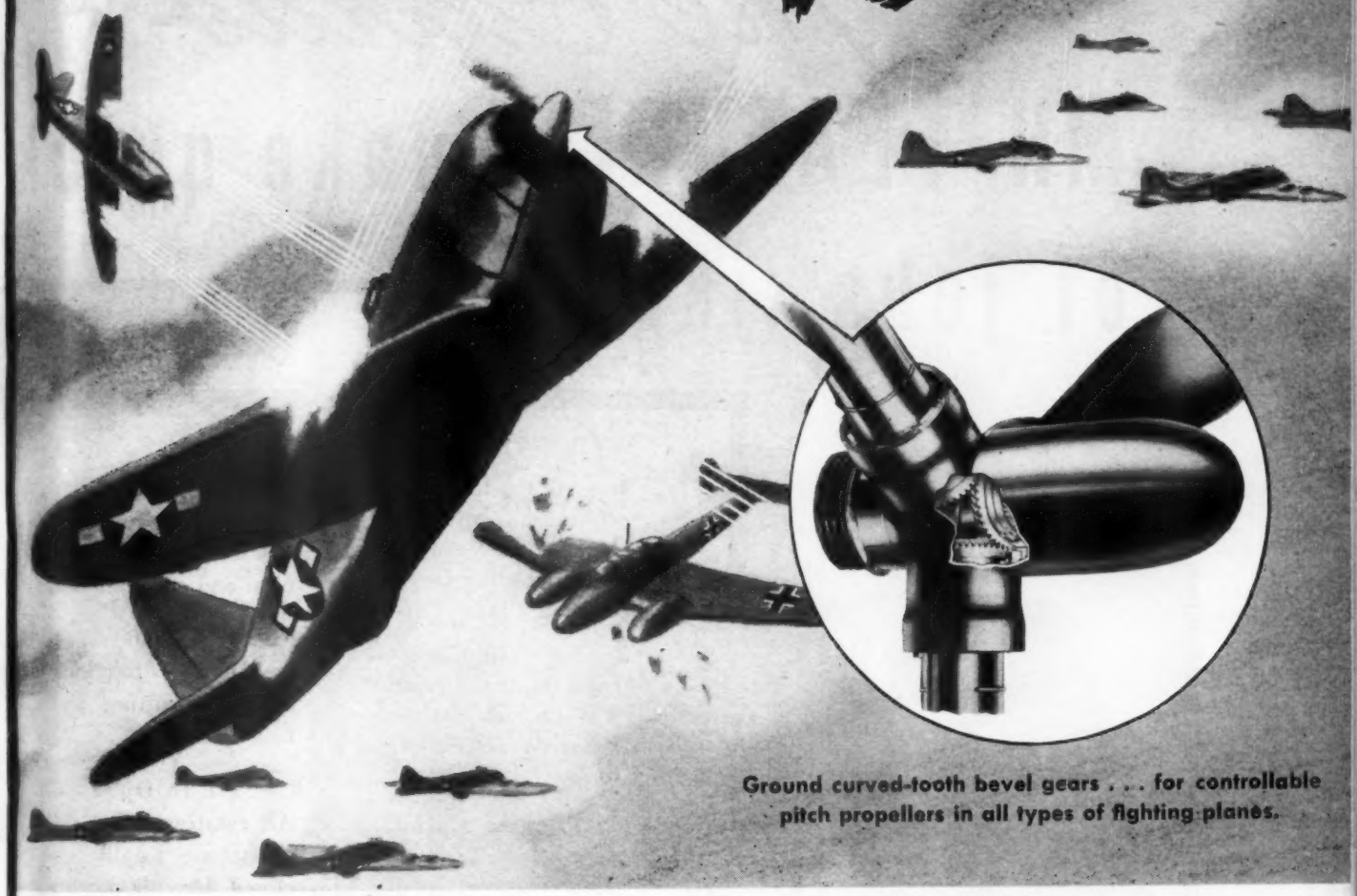
A widely used *American Machinist* service, this Manufacturers' Agents Directory lists firms handling tools, accessories, equipment and supplies for the Metal-Working industry in the United States. The war has caused a terrific number of changes, and if you have use for this buying and distributing guide, you'd better send for a copy. There is no charge.

o

Tools for Africa . . . *You may have seen the recent report that commercial trade channels are to be utilized for exporting small and hand tools to South Africa for non-military use. The announcement was the result of a plan proposed to Foreign Economic Administration officials by a group of U. S. tool exporters. Tools intended for military use will continue to move through government channels.*



BEVEL GEAR DRIVES — TO *Victory*



Ground curved-tooth bevel gears . . . for controllable pitch propellers in all types of fighting planes.

EXTRA POWER FOR EVERY EMERGENCY

By varying automatically in flight the angular direction or pitch of the propeller blades, controllable pitch propellers make possible the most efficient aircraft engine operation under all conditions . . . take-offs, speedy climbs, sharp banks, swift power dives or high altitude dog fights.

GROUND CURVED-TOOTH BEVEL GEARS PROVIDE INSTANTANEOUS, PRECISE FEATHERING OF ALL BLADES

Bevel gears are naturally used as the means of pitch control. A central bevel gear engages bevel pinion segments on the inner end of each blade shaft. Any slight rotation of this central gear in response to variations in power requirements instantly changes the pitch of each blade in the same amount.

The conical form of bevels allows assembling without backlash by the individual axial adjustment of each pinion. This decreases the likelihood of vibration and insures instantaneous changes of pitch as required.

Curved-tooth bevel gears possess localized tooth contact which compensates for minor deflections of the gears in operation. The hardened and ground tooth surfaces of these gears provide in a light-weight compact unit the strength to carry the torque and the accuracy to maintain uniform pitch of all blades.

CUT AND GROUND ON GLEASON MACHINES

These precision gears are cut on the No. 16 Machines and ground on the No. 17 Hypoid Grinder at high production rates.

This is just one illustration of the many uses of bevel gears in aircraft, which offer a promise of continually improved operation for the airplanes of the future.

GLEASON

GLEASON WORKS

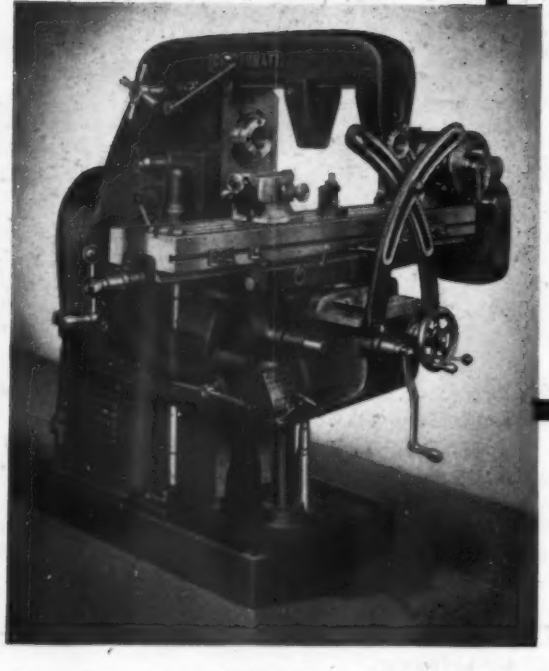
Builders of Bevel Gear Machinery for Over Seventy-five Years

1000 UNIVERSITY AVENUE, ROCHESTER 3, N. Y., U. S. A.

The Extras IN

MH FEATURES make quick

of jobs like this



CINCINNATI *No. 2 MH Milling Machine. Specification catalog M-1000 gives complete information. Write for your copy today.*

1 —All Control Levers of the CINCINNATI MH Miller are conveniently grouped for easy manipulation.

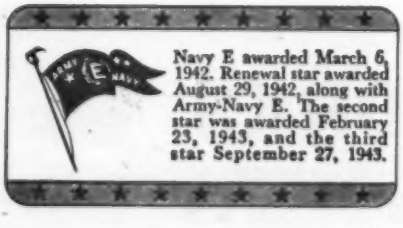
2 —Feed Changes at front of the machine. There's no walking around to change feeds.

3 —Fifteen Spindle Speeds from 23 to 1200 r.p.m. Correct cutting speed for milling, boring, sawing; for steel, cast iron, bronze, aluminum and other metals.

4 —Power Rapid Traverse in all directions. Reduces "cutting air" to a minimum.

5 —Safe to Operate. All rotating gears and shafts are totally enclosed. Driving mecha-

In looking over the above features, notice the extras which make the MH so desirable for the "RUSH-URGENT" jobs. Take the spindle speeds, for example: 23 to 1200 r.p.m. . . . the upper group is high enough for drilling and boring . . . the lower group for using large diameter circular saws; for milling hard materials . . . the in-between group for conventional milling operations. Then there's the commonplace item of lubrication — the MH



Navy E awarded March 6, 1942. Renewal star awarded August 29, 1942, along with Army-Navy E. The second star was awarded February 23, 1943, and the third star September 27, 1943.

THE CINCINNATI M

MILLING MACHINES

IN THE
ckwork

nism for Dividing Head
s completely encased.

6—Advanced Lubrica-
tion. All parts within
the column, including
spindle bearings, are
lubricated automati-
cally. Saddle, table and
knee parts are pressure
lubricated from oil
shot pumps.

7—CINCINNATI Rectan-
gular Overarm.

way saves time, minimizes wear and reduces main-
tenance. All in all, CINCINNATI MH's are *the* machines for light to medium milling machine work in toolrooms and job shops, in air base repair shops, and aboard ship. ¶ Write for specification catalog M-1000 which gives complete information on all features. For a brief description of the MH and other CINCINNATI Milling Machines, look in Sweet's Catalog File for Mechanical Industries.

Boring a close tolerance hole in a steel yoke. An eccentric chuck is mounted in the spindle. This is a typical toolroom setup where the high speeds of the CINCINNATI *MH Miller are used to advantage.*

CINCINNATI

MILLING MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES

In 1800 a man made this picture, "Grand Opera transported to the Home for the Benefit of Patrons of the Arts". But even he could not take the idea seriously, so impossible did its realization seem at that time. He could not have believed that within a hundred and fifty years his vision would become Television, because vision alone was not enough. Before ideas can serve us they must be put into production . . . they must be manufactured and sold at prices people can afford.

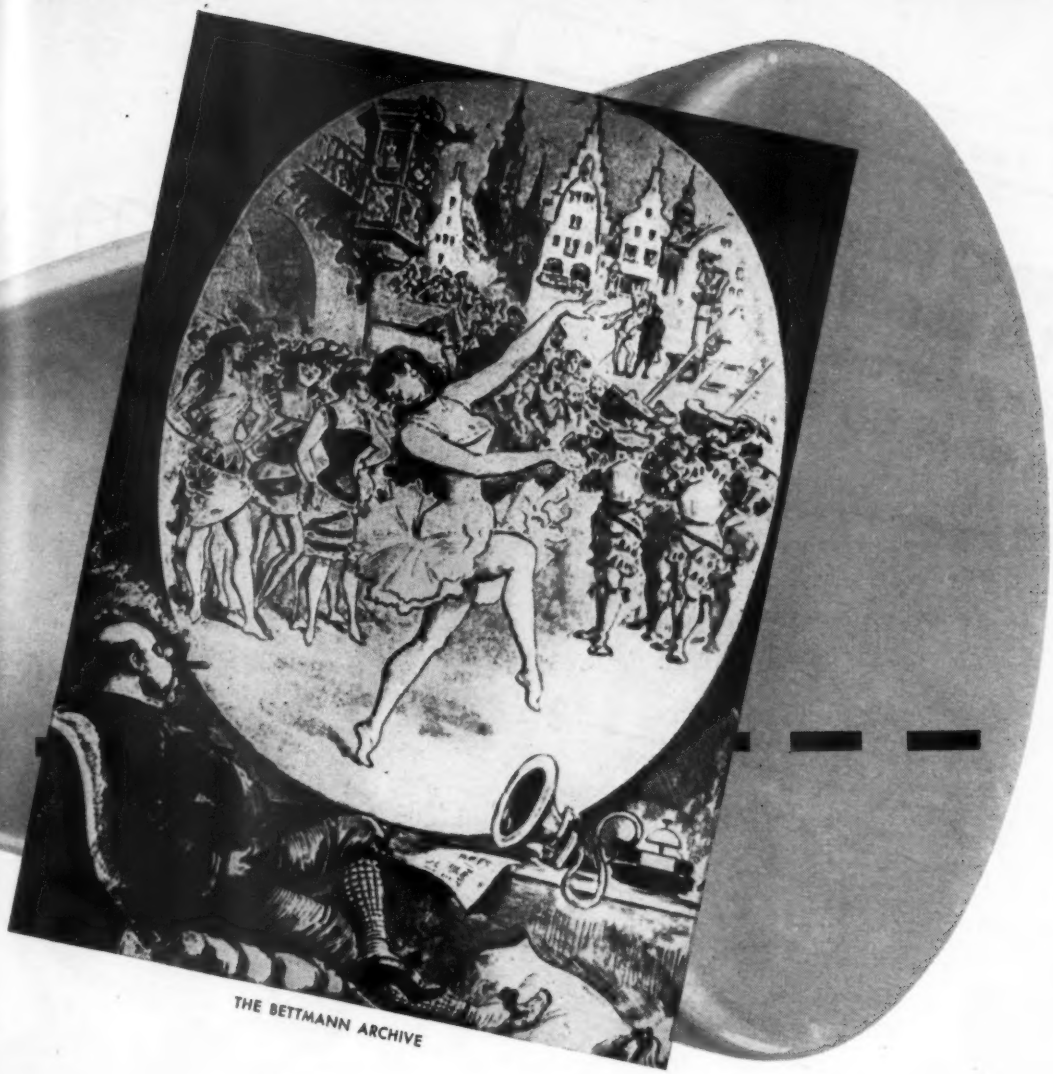
Probably there are more men with exciting new ideas today, than ever before in history.

And these men with ideas, in planning the production of these new and better things, have the help of makers of modern machine tools.

Jones & Lamson engineers are at your service to help you turn today's plans into tomorrow's realities.

Inspecting a complicated form with Jones & Lamson Bench Comparator

Television devices, and hundreds of other products, will present many manufacturing problems . . . problems involving the inspection of thousands of small, complicated parts . . . problems that can be solved by the use of Jones & Lamson Optical Comparators, by means of which even the most intricate parts can be inspected and measured to thousandths, or even tenths-of-thousandths of an inch by optical projection.



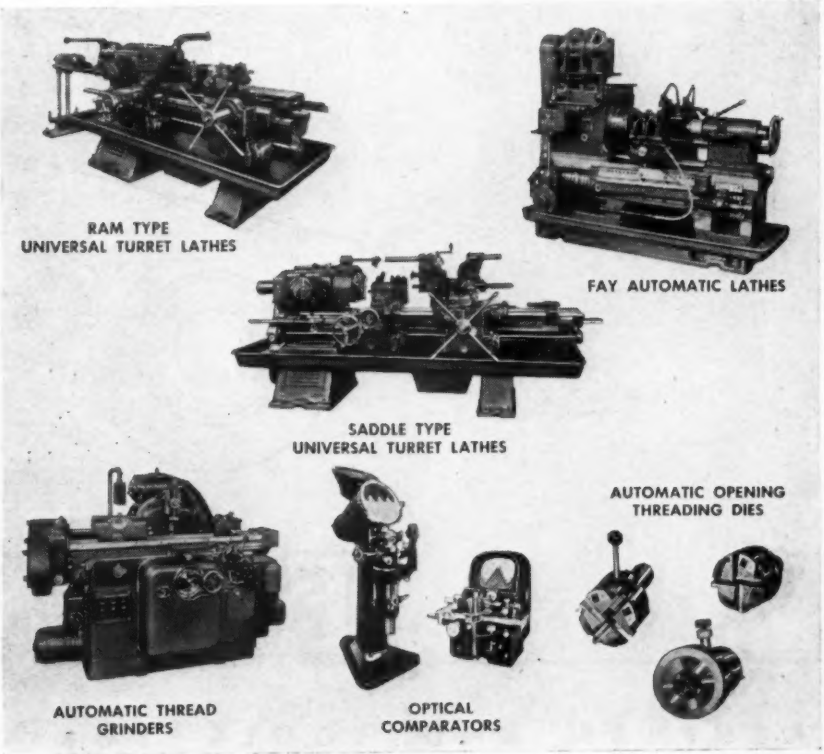
THE BETTMANN ARCHIVE

JONES & LAMSON
MACHINE COMPANY
SPRINGFIELD, VERMONT, U. S. A.

OPTICAL COMPARATORS

Manufacturers of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

PROFIT-PRODUCING MACHINE TOOLS

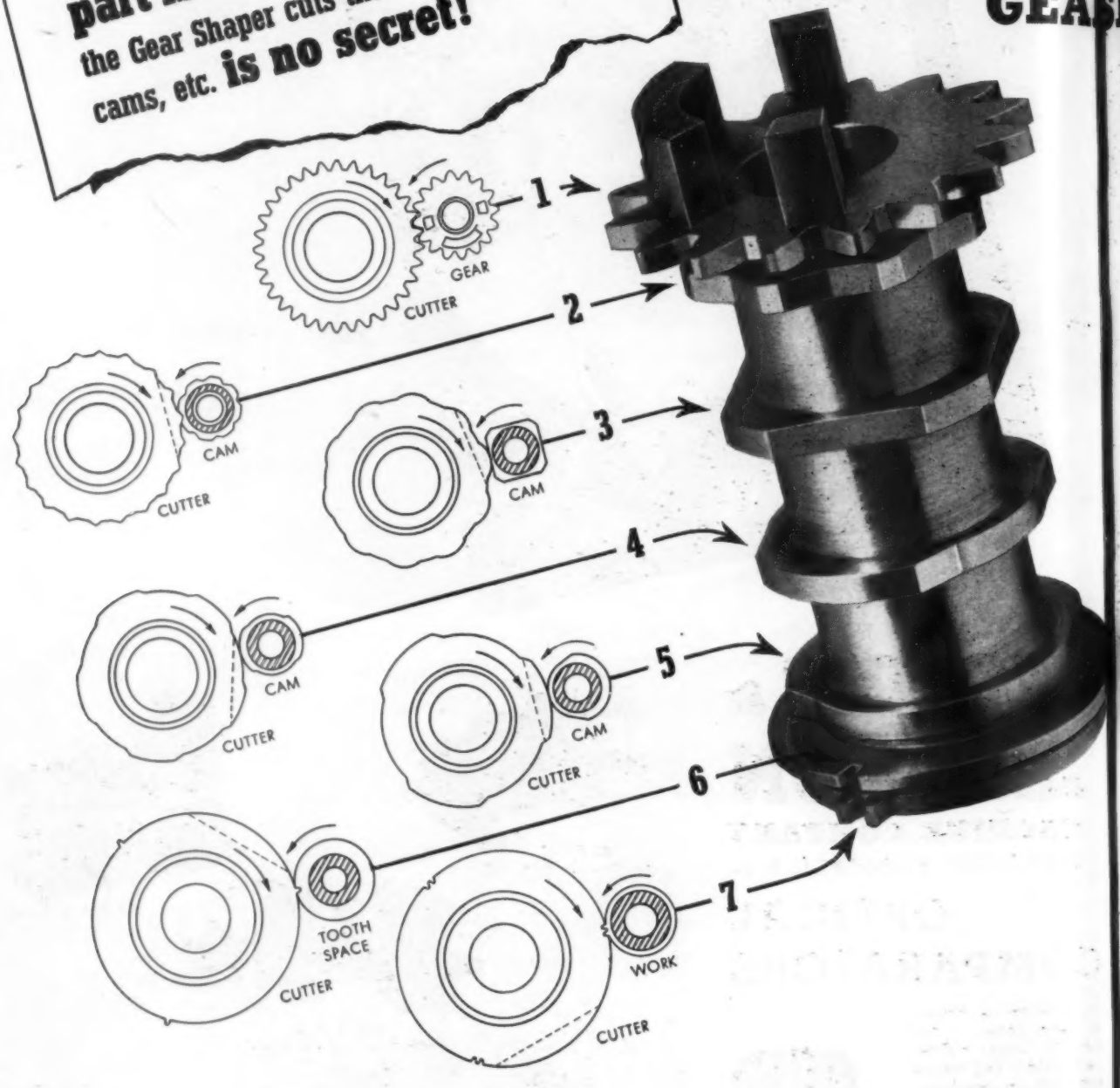


WAR PRODUCTION BULLETIN

We can't tell you what this part is used for—but how simply the Gear Shaper cuts the 7 different gears, cams, etc. is no secret!

Example A

GEASHA



FELLOWS

MACHINES AND TOOLS FOR GEAR PRODUCTIO

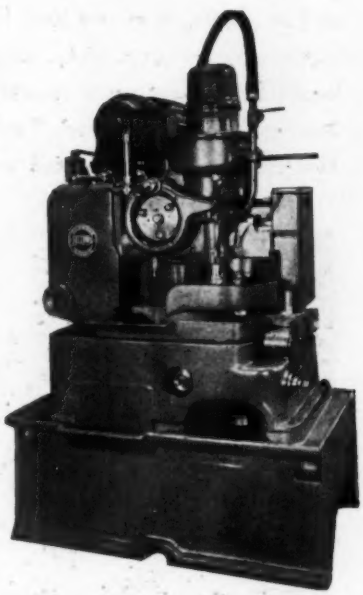
AA-1 OF THE EASHAPER'S VERSATILITY

Presented here is an excellent example of the Gear Shaper Method which employs a reciprocating type of generating tool. Seven different and distinct operations are performed on this part, as shown by the diagram, including four different shaped cams.

Of course, it requires a different cutter and set-up for each operation, but with Gear Shaper tooling, it is possible to hold the "positioning" of the various cams in alignment with each other within the close limit of 0.001 inch. All radii on the cams must be held to the same limit.

What at first glance appears to be an almost impossible machining problem has been simplified and made practicable by the Gear Shaper Method. And due to the accuracy inherent in the Gear Cutter, successive production lots can be exactly duplicated indefinitely.

Many other "problems" are illustrated in our general catalog, "The Fellows Method," for your copy, write: The Fellows Gear Shaper Company, Springfield, Vermont — or 616 Fisher Building, Detroit, or 640 West Town Office Building, Chicago, Illinois.



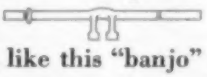
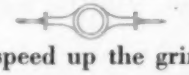
7A-Type Fellows High-Speed Gear Shaper

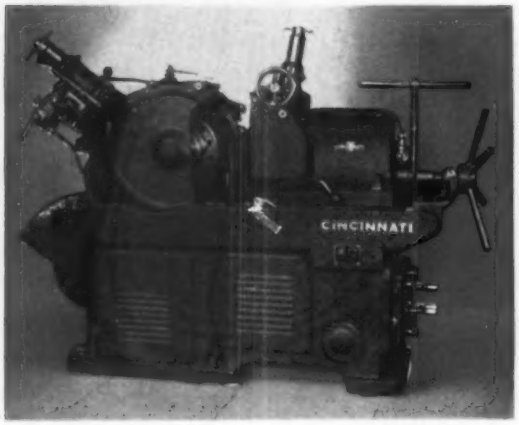
Method

. . . . FROM BLANK TO FINISHED GEAR

DON'T OVERLOOK THE CENTERLESS ME

Just because the part extends beyond the wheels

The advantages of the centerless infeed method of grinding can readily be applied to long parts, up to 55" in length, which require a ground diameter on one or both ends. CINCINNATI engineered Roller Infeed Work Rests solve the problem nicely. While one end of the work is being ground between the wheels, the other end is supported in exact alignment by rollers which allow free rotation of the part. ¶ The shape of the part between the ground diameters imposes little or no restriction on the application to centerless grinding. It can be a commonplace straight diameter, like the tank tread link in the large illustration at the right. It can be a special shape like this clutch release fork.  It can be much larger than the ground diameters, like this "banjo" housing.  In any event, Roller Infeed Work Rests simplify and speed up the grinding of parts which, at first glance, may not look like good centerless jobs. ¶ Perhaps many parts in your own shop, including those for your postwar products, could be ground more quickly and accurately on a CINCINNATI Centerless with Roller Infeed Work Rest. The engineers here at Grinding Headquarters will be glad to discuss this phase of grinding with you.



Right: A close-up of a CINCINNATI *engineered Roller Infeed Work Rest for grinding diameters on both ends of tank tread links. Left:* CINCINNATI *No. 2 Centerless Grinding Machine. Specification catalog G-456-1, giving complete details, will be sent on request. Write today.*

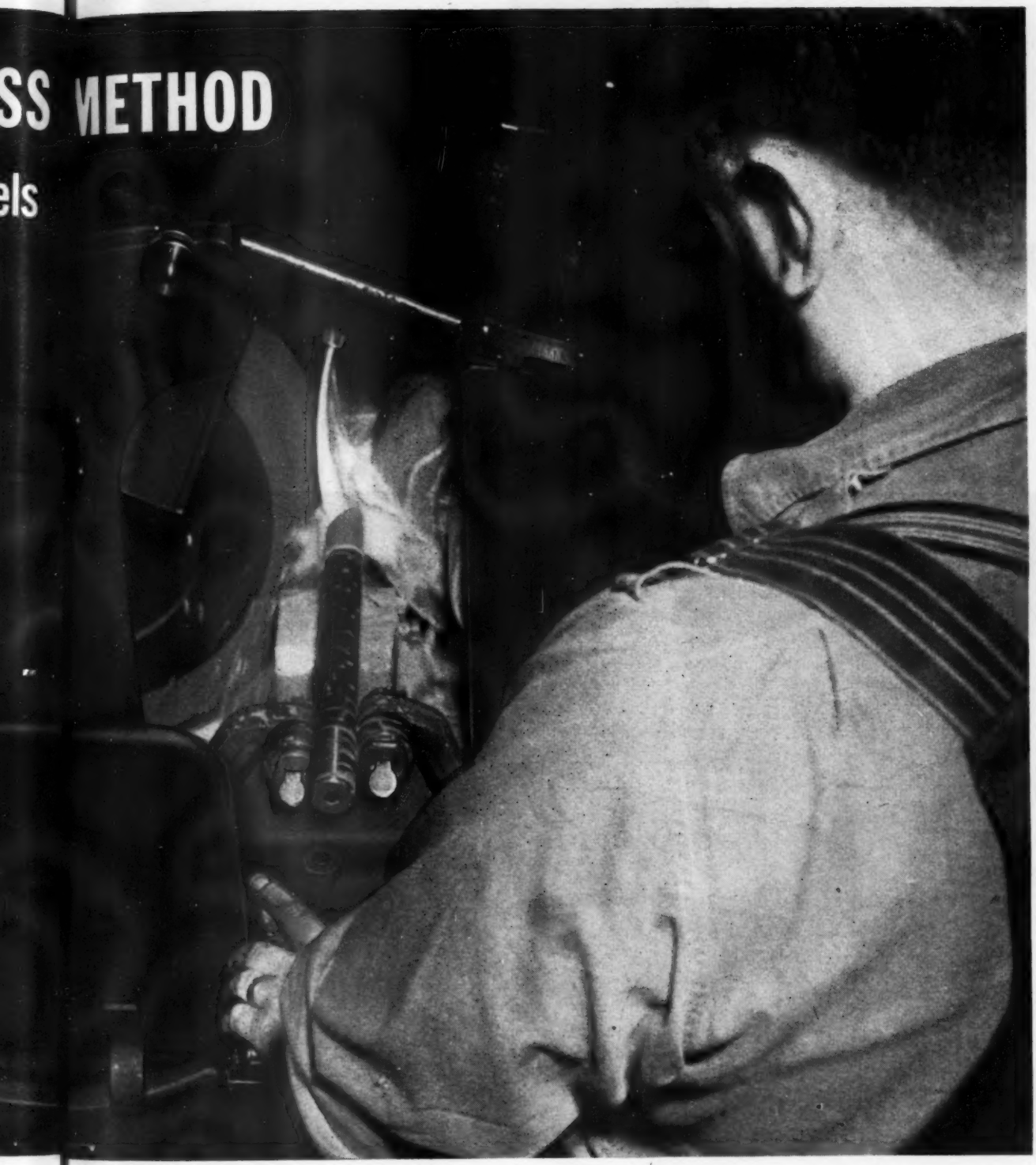
CINCINNATI

Navy E awarded March 6, 1942. Renewal star awarded August 29, 1942, along with Army-Navy E. The second star was awarded February 23, 1943, and the third star September 27, 1943.

CINCINNATI G

CIN

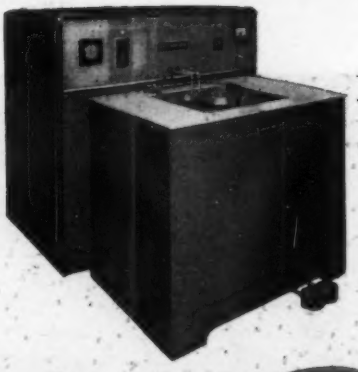
CENTER TYPE GRINDING MACHINES CEN



GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES



VAN NORMAN

APPLICATIONS: ***Surface Hardening, Brazing, Soldering, Annealing, Forging, Melting***

IT PAYS TO

HIGH FREQUENCY
INDUCTION HEATING EQUIPMENT

Speeds Localized Hardening Operations . . . Cuts Costs . . . Conserves Alloy Steels

Hardening gears, rack teeth, cams, shafts, precision gages, etc. to practically any Rockwell C and predetermined depth is accomplished in seconds on the Van Norman Induct-O. The speed and ease with which the parts are hardened not only simplifies the heating operation but also saves valuable time . . . cuts costs and often makes it possible to conserve alloy steels.

In the illustration, teeth of a two step gear are hardened to Rockwell 52C in 21 seconds. The hardening operation comprises of 12 seconds heat and 9 seconds quench. The gear is heated to 1/16" of tooth profile and hardness penetration is .035" to .045". There is no scale formed during the heating operation and warpage and deformations, often encountered under other heating methods, is eliminated. Since only the teeth have been hardened, there are no internal strains and drawing is unnecessary. And because plain carbon steel, such as X-1340, can be used for most parts previously made of expensive alloy steels, Van Norman High Frequency Induction Heating conserves vital alloys and permits substantial savings in material cost. Typical examples of parts hardened by the Van Norman Induct-O are shown at left.

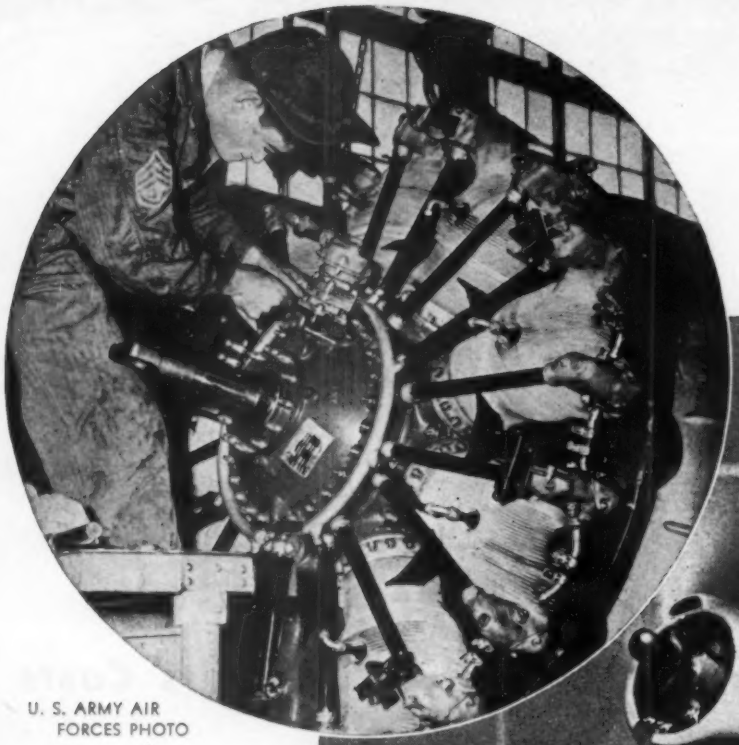
trated are but a few of the wide variety of parts successfully made of plain carbon steel and hardened by the Van Norman Induct-O.

If you have been trying to figure out how to speed up your hardening operations, then investigate the Van Norman Induct-O. Write for bulletin.

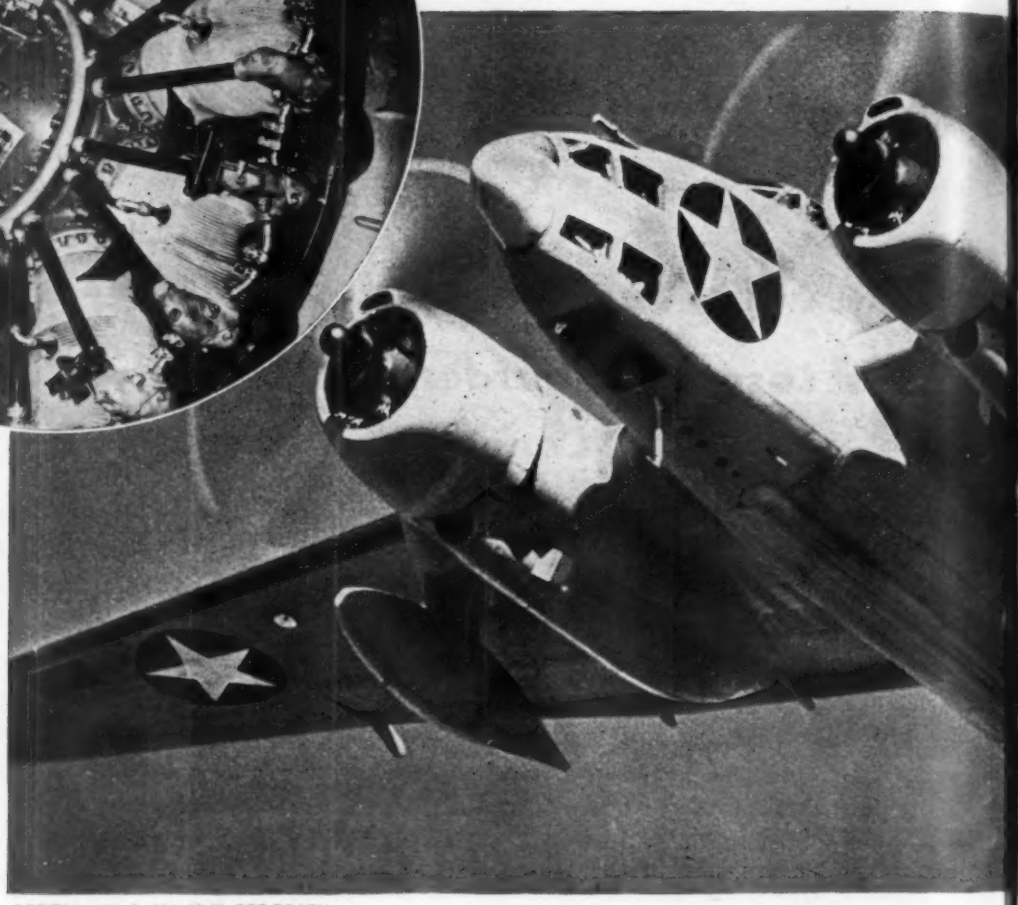
VAN NORMAN COMPANY
ELECTRONICS DIVISION
Springfield 7, Massachusetts

VAN NORMANIZE

Thousands in Control



U. S. ARMY AIR FORCES PHOTO

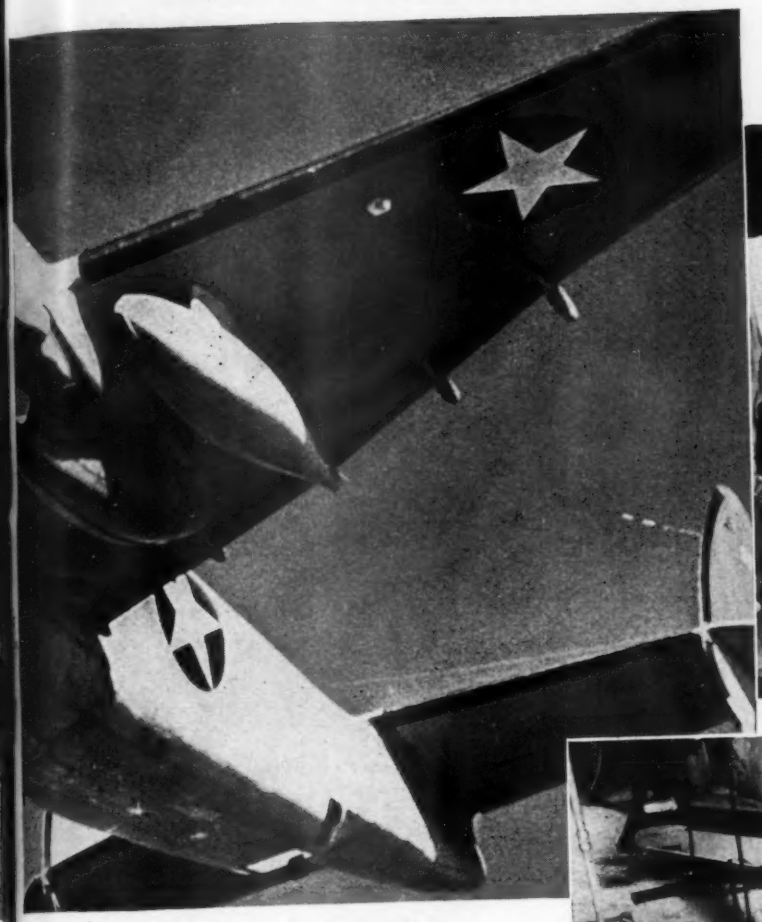


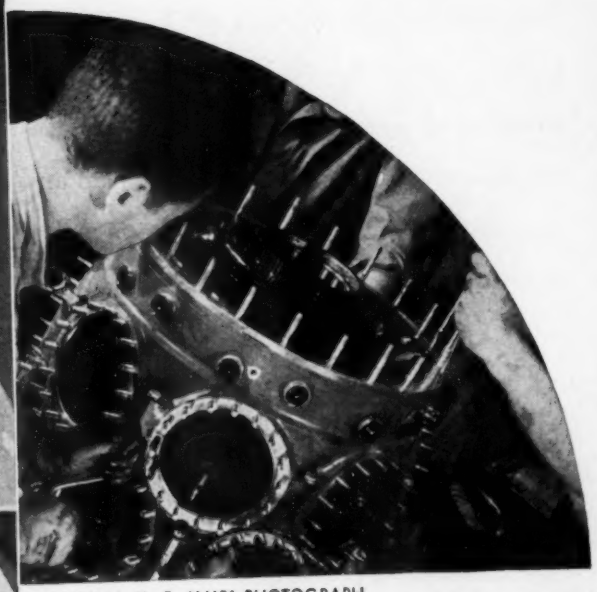
OFFICIAL U. S. NAVY PHOTOGRAPH

The motor is the all important heart of our fast, powerful warplanes. In carrying tremendous bomb loads to distant targets at amazing speeds, in dive bombing, escaping enemy ack ack, battling enemy fighters and bringing home a crippled plane, the engines are under terrific strain and vibration. But American engines have proved they can take it and keep going, mission after mission, thanks to American engineering. One of the reasons for the excellent performance of our warplane engines is the minute accuracy of the specially designed — — LANDIS THREADED — — studs employed in the cylinder heads, blocks and crankshaft cases.

LANDIS MACHINE CO.

of Flying Horsepower Held by LANDIS Threaded Studs





OFFICIAL U. S. NAVY PHOTOGRAPH

THE
LANDIS CHASER

WAYNESBORO
PENNA·U·S·A·

Quaker Chemical Research Insures

REVOLUTIONARY GRINDING RESULTS

...ELIMINATES: PICK-UP, GRINDING CHECKS, GLAZING, BURNING & DISTORTION

SOUNDS AMAZING doesn't it? Yet this newest development of Quaker Research—MICROGRIND #132—is *fundamentally different* from all previous grinding coolants . . . different in that it keeps a wheel or hone absolutely clean and open! Furthermore, it makes a water solution which actually prevents rust, odor, dermatitis and gum deposits.

These chemical properties of MICROGRIND #132—together with certain engineering changes which can be applied readily by a Quaker Process Engineer skilled in its application—make possible overall grinding efficiency and advantages never before considered possible.

Apply MICROGRIND #132 to any grinding, honing or superfinishing operation—the results will be equally outstanding!

Naturally, you will want to know just what this revolutionary new product will do on the grinding and finishing operations in your plant. The Quaker Process Engineer in your vicinity will gladly apply MICROGRIND #132 and its attendant engineering right on your own machines. Simply phone or wire our nearest office or use this handy request blank.

What this New Grinding Practice Has Accomplished:

- Complete elimination of "pick-up", tears, etc.
- Reduction of grinding checks to a point substantially less than ½ of 1%.
- Total elimination of burning.
- Development of superfine finishes, free of glaze.
- Control of distortion.
- Faster cutting.
- Elimination of 2 out of every 3 wheel dressings.
- Increase of wheel life up to 300%.
- Replacement of all straight oils.

TO OBTAIN MORE DATA USE HANDY FORM BELOW

QUAKER CHEMICAL PRODUCTS CORP.
CONSHOHOCKEN, PA. Other Plants in CHICAGO and DETROIT
Warehouse Stocks in Principal Industrial Centers

QUAKER CHEMICAL PRODUCTS CORP. • CONSHOHOCKEN, PA.

☐ Please give me further details on this revolutionary grinding practice.

Name_____ Position _____

• • • PLEASE PRINT COMPANY NAME AND ADDRESS IN MARGIN BELOW • • •

TOOLS ARE WEAPONS . . . TREAT 'EM RIGHT!

SIMPLIMATIC DEPARTMENT -FULLY MANNED!

HERE'S a case of manpower supplanted by machine power. The four Gisholt Simplimatics in this department (each of which can out-produce two or three manually operated machines) require only two men to tend them: Production moves swiftly with no apparent effort, for all machine functions are entirely automatic. No high degree of operator skill is required.

Adaptable to a wide range of work, with multiple cutting at high speeds, Gisholt Simplimatics are the practical answer where parts are produced in large lots and where precision is essential.

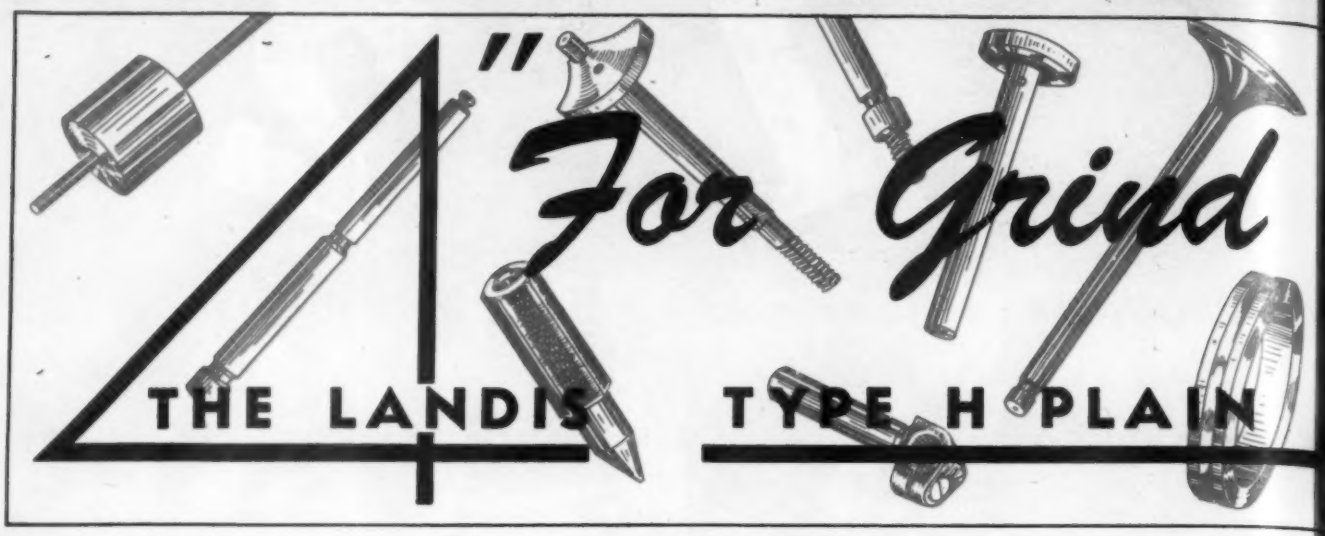
Today, Gisholt Simplimatics are saving time in the production of war materials. Tomorrow, they'll be cutting costs when costs are more important.

GISHOLT MACHINE COMPANY
1201 E. Washington Ave. • Madison 3, Wis.

Look Ahead... Keep Ahead... With Gisholt Improvements in Metal Turning

DETROIT PUBLIC LIBRARY

RRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES



Want to grind those very small parts just a bit faster than you are right now?

Practically anyone faced with this problem would quickly answer "Yes." Those who do should ask us for more information about the Landis 4" Type H Plain. If you are already using these machines, on the other hand, you are probably getting the maximum production possible on grinding equipment available today.

Many factors contribute to the productiveness of the Landis 4" Type H. Most important is the availability of a combination of cycles which makes it possible to handle work with the minimum number of manual operations. Of almost equal importance is the Microsphere wheel spindle bearing construction. This permits such close clearances that no appreciable time is required for sparking out at the end of the cut. Other factors are the great weight of the machine and its inherently sound over-all design.

Look at the five typical examples of unusual output recorded on these two pages. If you think such results are not possible in your plant, just challenge us to show you that they are.

426

GREAT

1 Chuck manufacturer grinds chuck jaws using a special fixture to hold the work — otherwise standard equipment. Production is 250 per hour within a limit of .0005" and removing .006" stock.

Unusual Performance as Usual

ing Small Parts

HYDRAULIC GRINDERS

PRECISION LANDIS GRINDERS

2 Large ball bearing manufacturer grinds small inner ball bearing raceways with a formed wheel and holding the work between centers on an arbor. Production is 130 per hour within limits of .0002" concentricity and .0005" diameter and removing .005" stock. Two arbors are used, the operator unloading and loading one while the other is in the machine.

3 Tap manufacturer performs 4300 operations in 10½ hours on ¼" taps. In this period, 2000 shanks are ground removing .006" stock and 2300 flutes removing .012" stock.

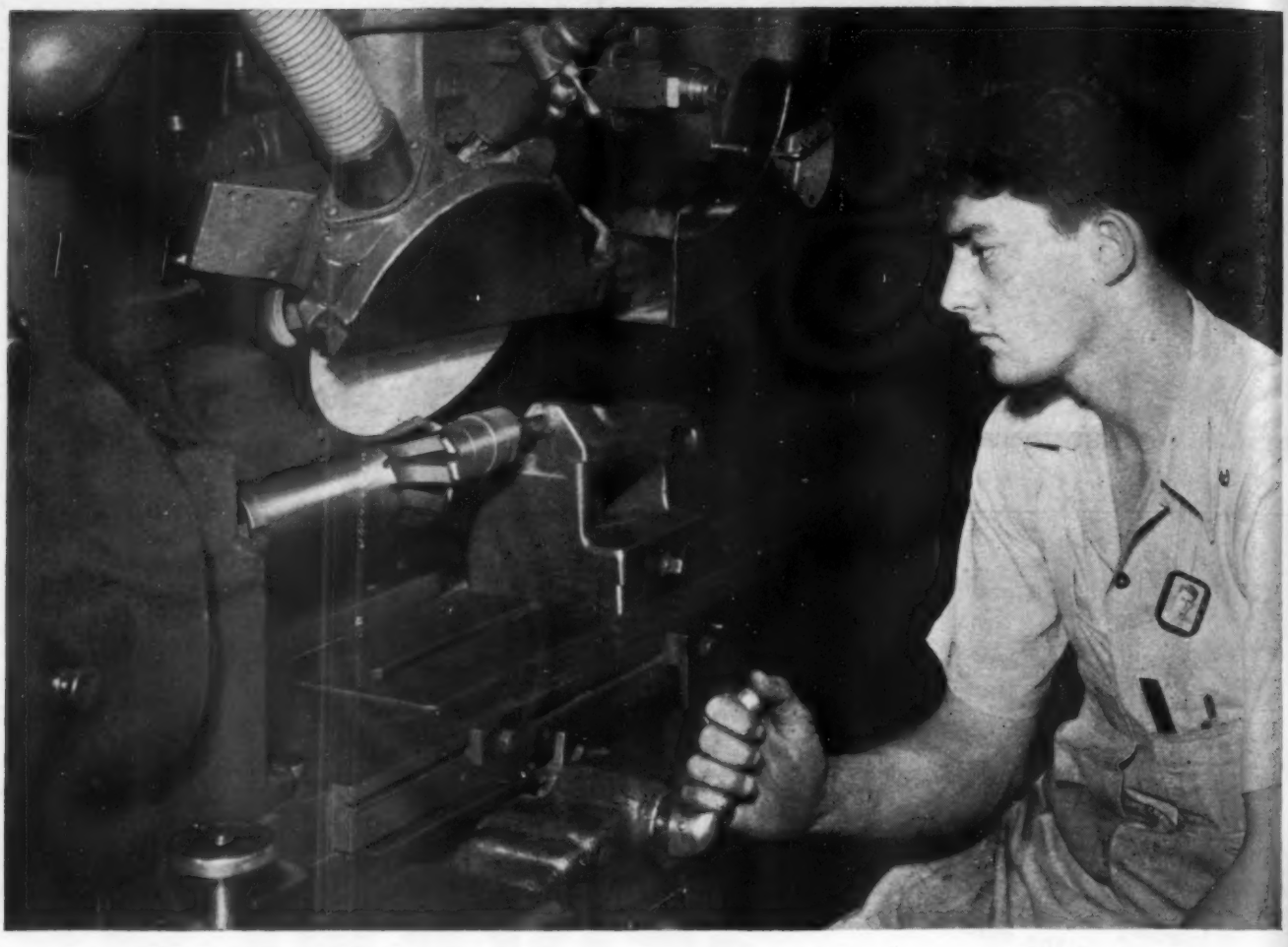
PRODUCTIVENESS

4 Electrical equipment manufacturer grinds three surfaces of a small exceedingly tough stainless steel shaft. These parts are finished from the rough to final size removing .015" to .018" stock. Three separate operations are performed with the rate of production being the same for each operation, that is 1300 in 8 hours. Limits on end diameters are .0003", on middle diameter .0004".

5 Instrument manufacturer grinds gimbal journals within limits of .0003" and removing .008" stock. Each gimbal has a large journal on one end and a small journal on the other. Both are ground as a part of the same operation simply by turning the piece end for end. 180 journals are ground per hour compared with previous production of 50 journals per hour on a hand operated machine. This increase in production is typical of what might be expected when a modern 4" Type H is installed and when the nature of the work being ground is such that a completely automatic grinding cycle may be employed.

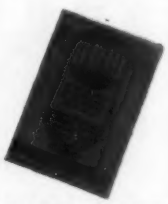
LANDIS TOOL COMPANY

WAYNESBORO—PENNSYLVANIA



PROPER SHARPENING WILL HELP TO GIVE LONGER LIFE TO YOUR MILLING CUTTERS

WITH a widely-recognized urgency for conservation of cutting power, more and more users of milling cutters are making strong efforts to see that wasteful mistreatment of small tools is eliminated. Many of them have studied this problem as it applies in their own plants and have set up standards of procedure which have resulted in substantial economies. It is often found that much of a cutter's original accuracy and cutting power is sacrificed through improper sharpening. "Proper sharpening" means keen cutting edge, absence of both diameter and face run-out, and correct cutting clearances for the job. On form-relieved cutters, special attention must be given to radial tooth faces, uniform index, and accurate gash angle. Principles of proper cutter sharpening are set forth in our booklet "How To Get the Most Out of Your Milling Cutters". Copies are available for members of your organization who need this type of information, simply by making a request on company letterhead. *Get the most out of your cutters* by proper sharpening.



SEE PAGES 283-291

Buy War Bonds

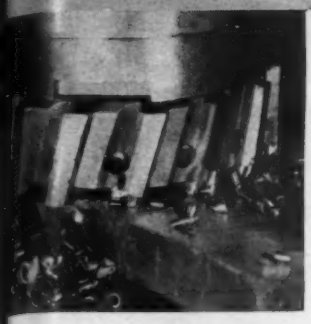
BARBER B-C COLMAN PRODUCTS

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

Barber-Colman Company

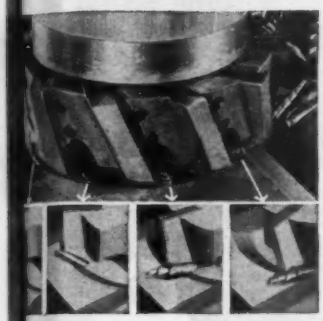
GENERAL OFFICES AND PLANT • 111 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.

INGERSOLL CUTTERS AND CUTTER GRINDER..



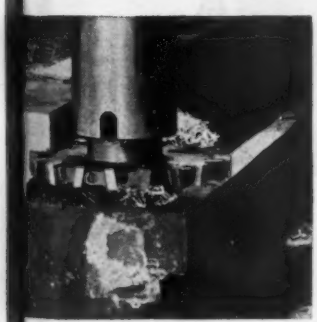
INCREASE PRODUCTION AND TOOL LIFE

NX FACE MILLS are recommended where a cutter of general application is required capable of taking heavy cuts on both periphery and face in steel or cast iron.



SHEAR CLEAR FACE MILLS are a patented cutter designed to cut continuous chip materials such as steel, aluminum, and copper at increased feed rates. They produce a smoother finish, give longer tool life, and use less power. Application limited to flat surfaces.

END MILLS with solid shanks are designed for milling small faces, steps, or grooves; or for heavy cuts with stock to be removed by both face and periphery of cutter. End Mills are also available with Ingersoll helical blades illustrated at left.



SIDE MILLS and Staggered Tooth Slotting cutters of all types are manufactured by Ingersoll for a wide range of applications from very light cuts to railroad rod channeling.

HELICAL SLAB MILLS are efficient and renewable inserted-blade cutters with blades forged, twisted, hardened, and then ground to true helix to fit accurately helical milled slots in body. Also made as solid shank end mills.

WRITE *for Engineering Specification Sheets for full description of Ingersoll standard inserted blade cutters.*

CUTTER GRINDER shown above will grind in a single setting of the cutter the face, periphery, and corners. Capacity, 4″ to 30″ in diameter with 7″ maximum peripheral face. It will grind face mills, solid shank, radius, staggered tooth, and angular inserted blade cutters. It is fast, accurate, and may be operated by the average mechanic. Write for Catalog No. 54 for complete details and operating instructions.

Ingersoll manufactures a complete line of inserted blade type milling and boring cutters for all purposes. Your inquiries will receive prompt attention.

THE INGERSOLL MILLING MACHINE CO., ROCKFORD, ILL.

GOOD NORTONS *for our* GOOD NEIGHBORS...

GRINDERGRAM

A number of medium light cuts will produce a better ground finish, give greater wheel life and improve production over that of a few "hogging" cuts.

NORTON GRINDERS *set new standards in* SOUTH AMERICAN PRODUCTION

SOUTH AMERICA is tooling-up for the production of armament and the maintenance of domestic industries. In this enterprise Norton Grinding Machines provide our Good Neighbors with precision and durability.

Our Pan-American friends are determined to help the Allied cause by helping themselves. In Brazil, for example, a famous U. S. airplane motor is building. In the production of munitions and marine carriers, in maintenance of railway equipment, and in both light and heavy industries, all vital in our joint struggle against aggression, Norton Grinding Machines will set new standards of production and precision in South America.

NORTON COMPANY • Worcester 6, Mass.

M-478

Installing a Norton 23" Hi-Swing Grinder at the Brazilian Marine Arsenal.

NORTON GRINDERS and Lappers

7 ways to turn sma

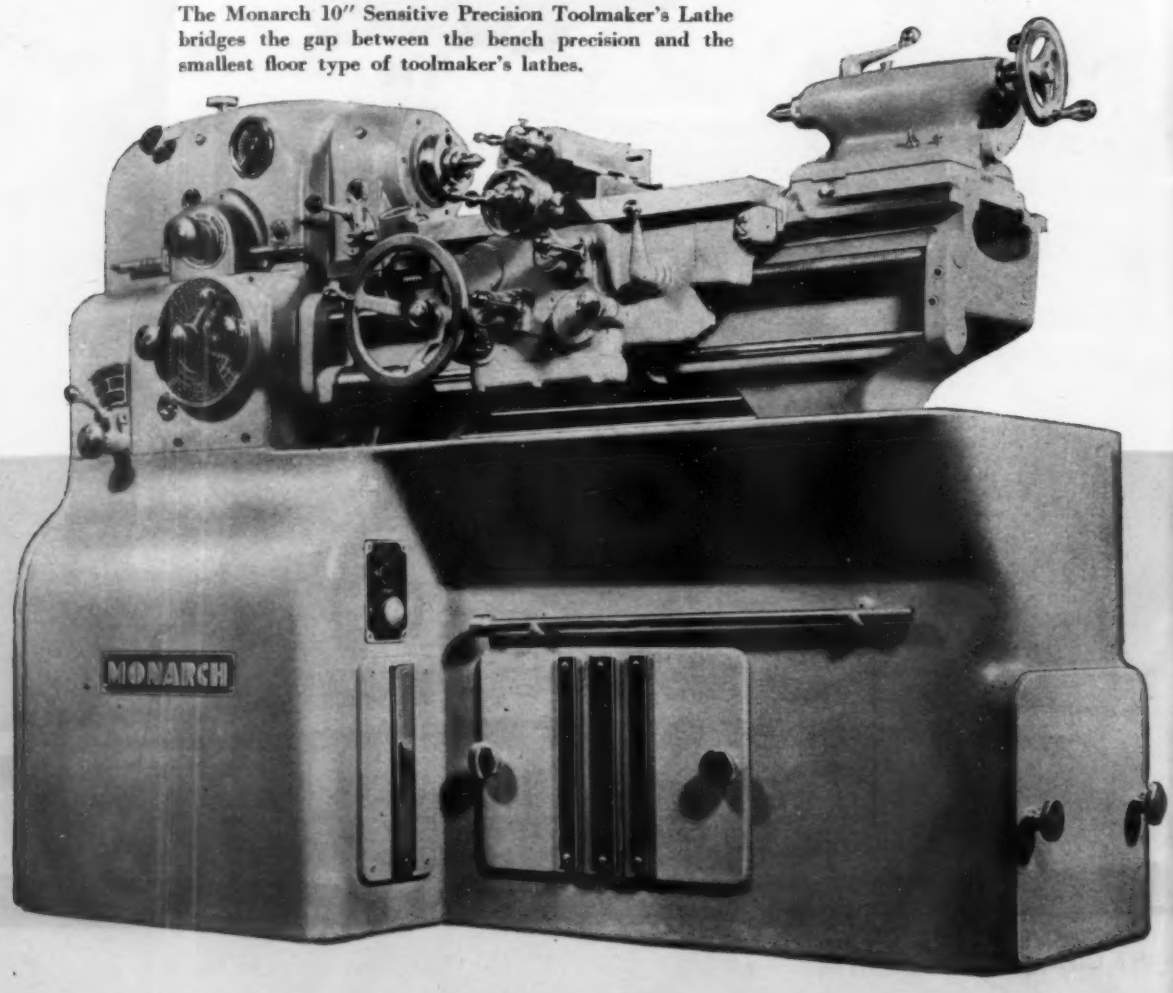
While the Monarch 10″ Sensitive Precision Toolmaker's Lathe is a complete unit in itself, its productive capacity can be greatly increased by the addition of one or more special attachments, such as those illustrated. Thus this high-precision toolmaker's lathe can be converted into a production lathe, for quick and accurate turning of a great variety of small parts.

This is made possible by the built-in features which mark this as the outstanding Toolmaker's Lathe. It has an almost unlimited range of gearless, stepless, spindle speeds. Anti-friction bearings are used throughout. Separate threading gear train is reserved for accurate thread chasing work. The lathe is rigidly built, with especially easy and accessible controls. Its ability to stand up under the grueling conditions of 'round-the-clock operations has been proved in hundreds of War plants.

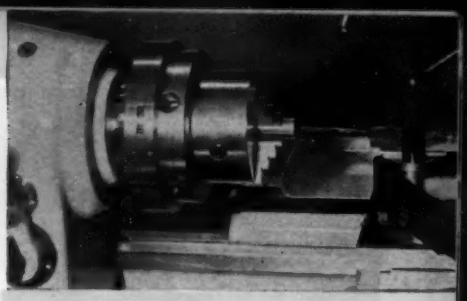
We shall be glad to work with your engineers, to help you improve your production with these and other available attachments for Monarch Sensitive Precision Toolmaker's Lathes. Address the factory or the Monarch branch listed in your telephone book.

THE MONARCH MACHINE TOOL COMPANY • SIDNEY • OHIO

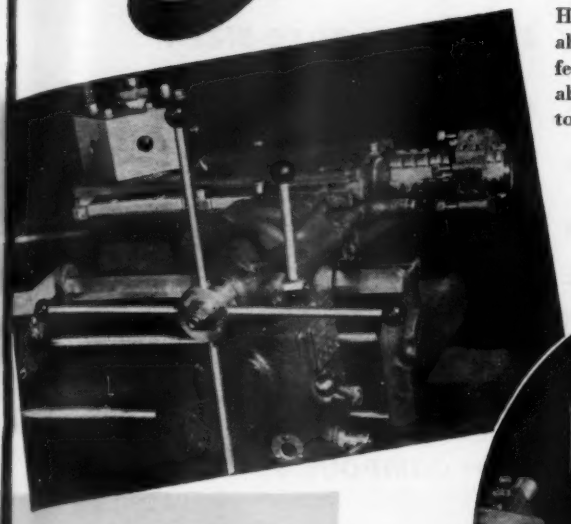
The Monarch 10″ Sensitive Precision Toolmaker's Lathe bridges the gap between the bench precision and the smallest floor type of toolmaker's lathes.



parts faster!

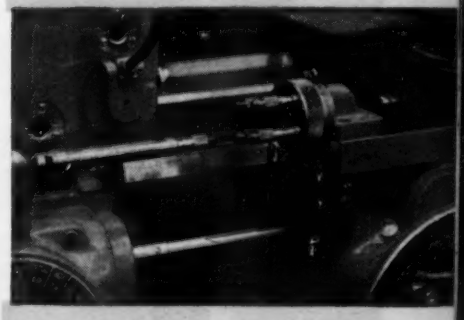


Multiple index faceplate, providing for Camlock holding of driver plate for outside threading, or a chuck for inside multiple threading.

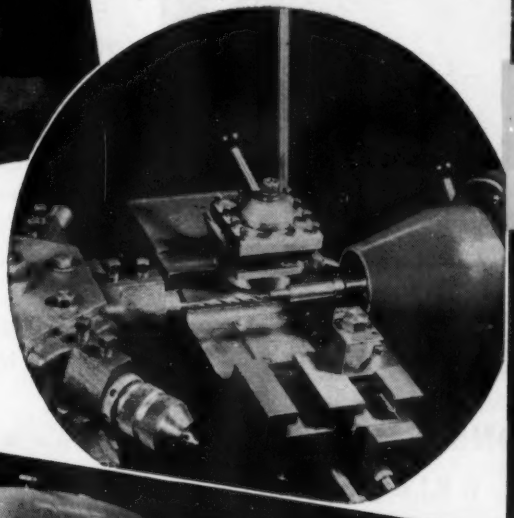


Hexagon ram-type turret is available with either hand or power feed to the ram, and has adjustable automatic stop for each tool position.

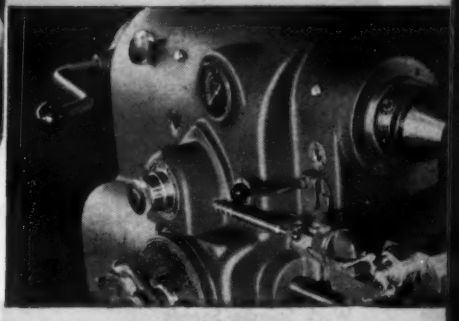
Double-connected slide, hand controlled, with automatic stop in both directions, mounted on the long bottom slide and adjusted by cross-feed screw.



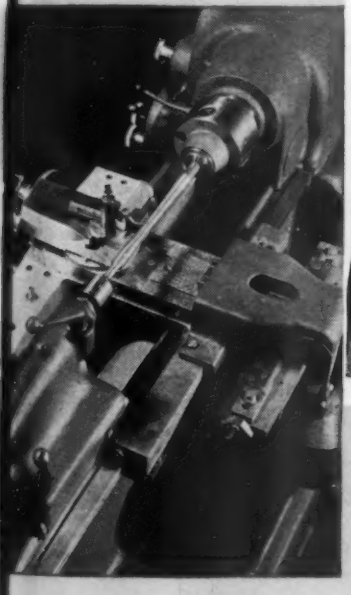
Multiple positive length stop, with four positions and four micrometer heads for fine adjustments. Mounts on left-hand wing of the carriage.

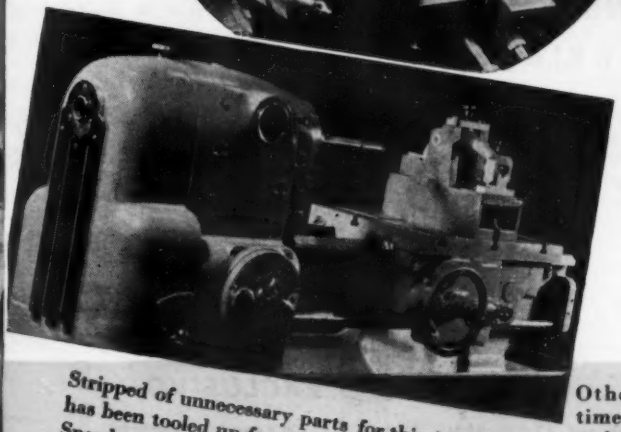


Profile attachment for reproducing on the work, the form of the hardened steel template.



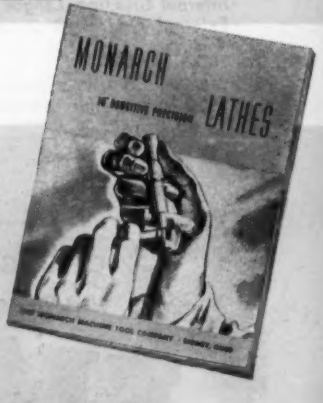
Lever-operated collet chuck on headstock. A simple push releases the work and a pull tightens the work. A big timesaver in manufacturing operations.





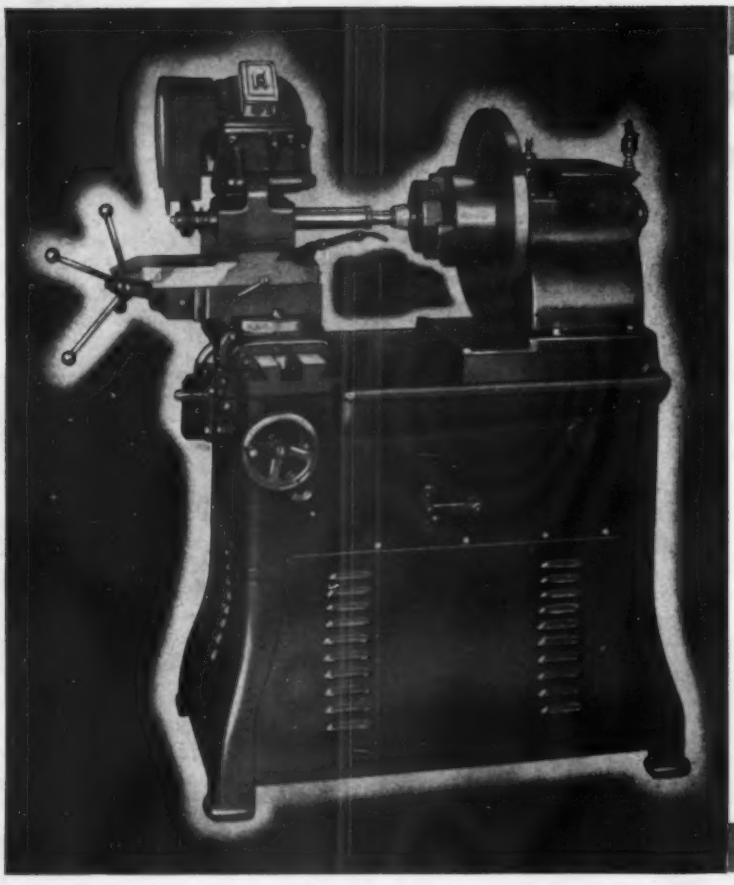
Stripped of unnecessary parts for this job, the lathe has been tooled up for production as a boring lathe. Speeds as high as 5000 rpm can be utilized.

Other special timesaving attachments available are described in this booklet. Ask for Bulletin 10-EE F, on your letterhead, please.



MONARCH LATHES

Save Time



THE *Convertible*

- ★ **EXCLUSIVE AUTO-SIZER**
- ★ **ADJUSTABLE WORK HEAD**
- ★ **RAPID CHANGE-OVER**
- ★ **AUTOMATIC POWER CROSS-FEED**
- ★ **MICROMETER FEEDS**
- ★ **SCREW AND RACK AND PINION INFEED**
- ★ **360° COMPOUND**

TURNS AND GRINDS

INTERNAL • EXTERNAL SURFACE & TAPER JOBS

SPECIFICATIONS

LEMPCO MODEL ACX GRINDER

Work Spindle Speeds	80-130 RPM
Carriage Feed	.020"
Swing	18"
Grinding Range:	
Face Grinding	18"
Internal Grinding, Diameters up to	18"
Internal Grinding, Length	8"
External Grinding	8"
Turning Range:	
Maximum inside diameter	18"
Maximum outside diameter	18"
Face Plate Diameter	18"
Carriage Travel	16"
Cross-Slide Travel	9"
Grinder Spindle Speeds	*6,000 and 12,000 RPM*
Shipping Weight	*approximately* 1650 lbs.

CEILING - PRICED

Write for Specifications

LEMPCO

5711 DUNHAM ROAD
BEDFORD, OHIO, U.S.A.

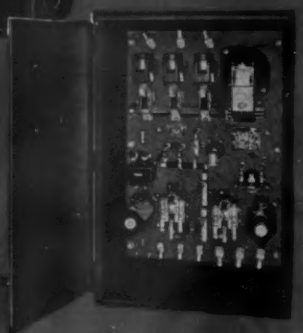
The *Convertible* is a compact, powerful, precision grinder that is versatile, fast, and efficient. Initial cost is low. Simplicity of construction insures economy of operation. For today's easy-profit jobs and tomorrow's competitive demands. Equally at home in tool room or on the production line.

GOOD DELIVERY!

EXCLUSIVE AUTO-SIZER

Saves man-hours on single operations done at production speeds. Dial indicator sizes directly from work diameter. Exactly duplicates successive pieces on long runs.

Across-the-line A-C Magnetic Starter for Squirrel-cage Motors.



Reversing and Non-reversing Magnetic Starter.

Autotransformer Type Magnetic Reduced Voltage Starter.

Starting and speed regulating Rheostat.

Manual Motor-starting Snap Switch.

Reversing Drum Switches for Across-the-line Starting.

Type H Sentinel Breaker for Fractional Hp Motor Starting.

Manual Multi-speed Drum Controllers.

"De-ion" Motor Watchman Reversing and Two-speed Manual Starters.

Manual Multi-speed Drum Controllers.

Reversing Drum Controller for use with Primary Resistance.

Across-the-line "De-ion" Manual Motor Starter.

Standard Motor Control

FOR POSTWAR RECONVERSION

Westinghouse All-Purpose A-C Controls

Postwar reconversion will bring important control problems—you'll need all-purpose controls—and you'll need them quick.

Westinghouse is ready NOW to help you solve these problems—with a complete family of A-C Controls, a few of which are pictured here. They offer the maximum in flexibility of application and ease of installation.

Start now to anticipate your postwar control needs. For your assistance, Westinghouse has compiled a complete new volume of Control Buying Data (Catalog 7000). Get your copy today from the nearest Westinghouse district office (distribution will be made from district offices only—no mailings from Westinghouse headquarters). Westinghouse Electric & Manufacturing Company, East Pittsburgh, Penna.

J-21307

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Motor Control

The battle against the subs is NOT over. Sure, the record of our fight against them is a gallant one. But the end is not yet. We are building more steam and diesel engines than ever. Turning out cannon and war-making machinery that, in time, will silence the enemy. Meantime, Americans—keep that guard up!

GENERAL MACHINERY CORPORATION

GENERAL MACHINERY CORPORATION

HAMILTON, OHIO

THE NILES TOOL WORKS CO.

THE HOOVEN, OWENS, RENTSCHLER CO.

GENERAL MACHINERY ORDNANCE CORPORATION

Battery of "Type D" 16". 6-spindle Mult-Au-Matics machining cylinder barrels for Wright Aeronautical Cyclone Engines. On this job 5 operations are completed in one cycle of 11 minutes.

because of Production Batteries like this

Planes—Courtesy of U. S. Navy

Pictured here is one of the reasons why America is now getting the planes in the overwhelming numbers that we need. Each of these Mult-Au-Matics machines 5 airplane engine cylinder barrels at once . . . and remember that this battery is but one of scores like it, many of which are on jobs other than airplane engine work.

THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT

A PLACE IN THE SUN

MID-WEST honing and superfinishing stones, the world's most efficient abrasives, have earned their place in the sun for one predominant reason: THEY CAN BE DEPENDED ON TO DO THE JOBS FOR WHICH THEY ARE MANUFACTURED — AND DO THEM EFFICIENTLY.

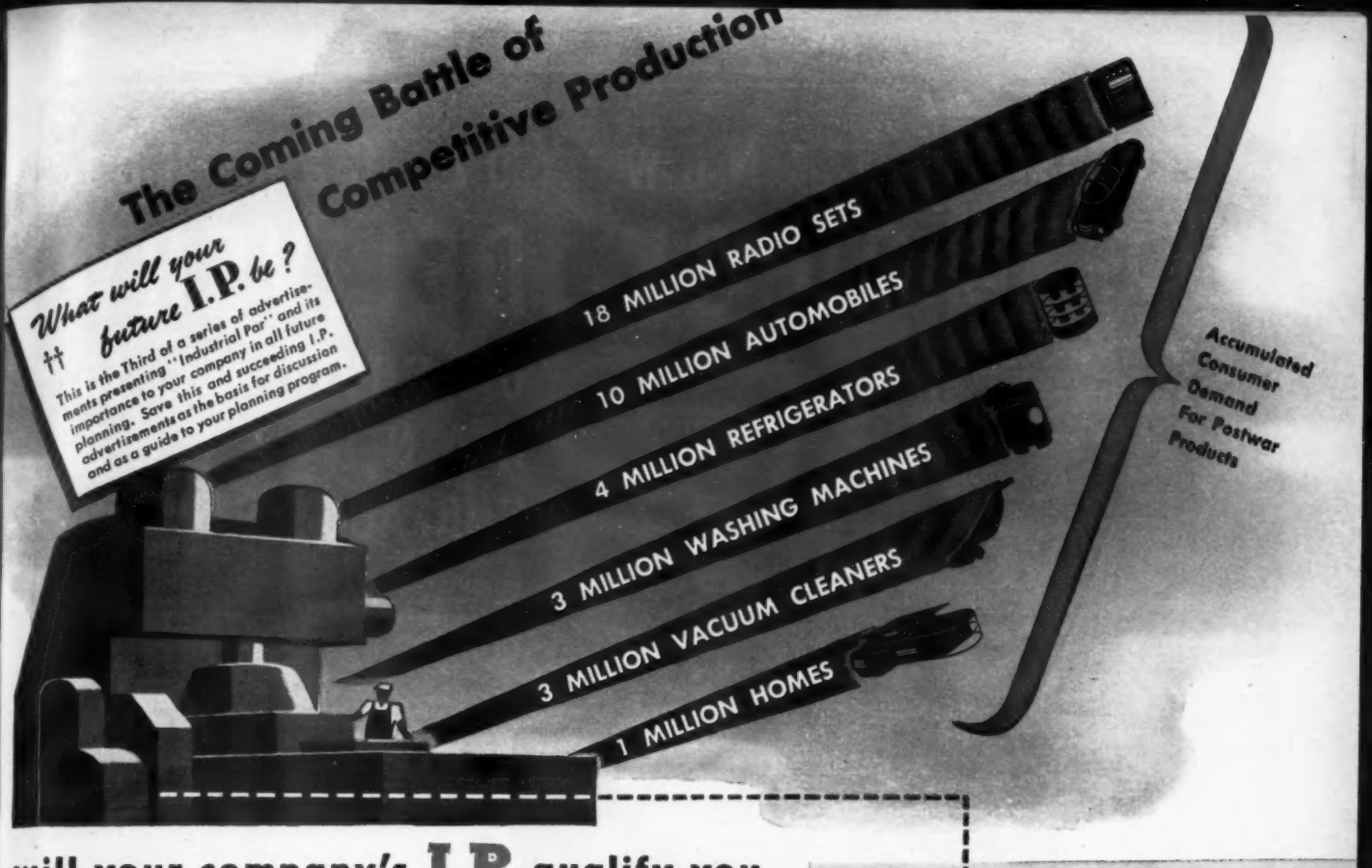
MID-WEST engineers have maintained quality and dependability in MID-WEST honing and superfinishing stones by exercizing unusual care during the manufacturing processes — from selection of the raw materials to packaging the finished product. That care, coupled with MID-WEST'S extensive experience in the abrasive field, has ensured a product that cuts faster, cooler, smoother and more economically than anything else in its class.

MID-WEST honing and superfinishing stones perform better than ordinary abrasive stones because they are made with MICRO BOND, the remarkable new abrasive developed and manufactured by MID-WEST specifically for extremely close and superior finishing operations. Their speed, efficiency and economy will amaze you!

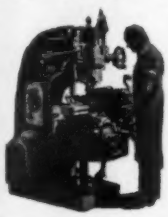
MID-WEST ABRASIVE COMPANY

Manufacturers of DEPENDABLE Abrasives

1960 E. Milwaukee Avenue **Detroit 11, Mich.**


The Coming Battle of Competitive Production
What will your future I.P. be?
†† This is the Third of a series of advertisements presenting "Industrial Par" and its importance to your company in all future planning. Save this and succeeding I.P. advertisements as the basis for discussion and as a guide to your planning program.
18 MILLION RADIO SETS
10 MILLION AUTOMOBILES
4 MILLION REFRIGERATORS
3 MILLION WASHING MACHINES
3 MILLION VACUUM CLEANERS
1 MILLION HOMES
Accumulated Consumer Demand For Postwar Products

will your company's I.P. qualify you to meet the Challenge



THERE'S a lot of "wants" waiting to be supplied by peacetime production. Millions of people are just marking time—with billions in money saved and ready to spend — to buy new radios, cars, refrigerators, washing machines, vacuum cleaners, homes and scores of other products as soon as they become available again.

When this flood of pent-up purchasing power breaks, American industry can expect a hard battle of competitive production. The old rule of three in manufacturing consumer goods—quality, quantity, low cost — will be in full sway again.

Manufacturing for peacetime markets will challenge managerial skill as much as manufacturing for war. Building a dominant position in these markets — finding profits — establishing the conditions for employment — will call for broad-visioned plans, able direction and execution.

To improve quality — reduce cost — and increase the output of goods, machine tools — the newest and finest — are indispensable. Machine tools are of key importance in determining your company's standing in terms of *industrial par* — the constantly increasing output per man-hour equal to approximately 50% every 10 years.

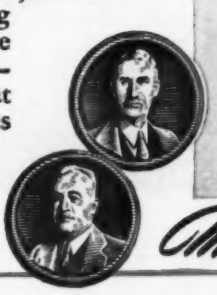
Other things being equal — quality of product, price, sales organization — the successes in the coming battle of competitive production will come to those companies best qualified to attain or excel industrial par — its vital significance as summarized in the panel headed "Spotlight Facts for Your Future I. P. Planning."

Your planning for postwar should include as a major project the matter of machine tools — provision for their continuing replacement to assure full productive capacity — to enable you to keep step with a high level of national prosperity — the volume production of more goods for more people at lowest cost and the resulting security of jobs and wages for the greatest number of workers.

Spotlight facts for your future I.P. *planning*

- ✻ Production methods — developed in wartime —increase man-hour output; pent-up buying power — released in peacetime — demands increased production.
- ✻ The rate of 2½% increase per year output per man-hour, established by a 12 year record of industrial production, can be expected to reach at least 4% per year — compounded.
- ✻ Manufacturers must set a goal of 50% increased output per man-hour every 10 years — to maintain a high level of national prosperity and achieve its benefits in terms of security of jobs and wages for the greatest number of workers and the volume production of more goods for more people at lowest cost.
- ✻ Machine tools — the most modern, most efficient — are recognized as the most effective implements of mass production and increased output at lowest cost — but only continual replacements with the newest and finest machine tools assures full productive capacity. *Such replacements yearly should be equal to 10% of the total machine tool investment — in keeping with increased output.*
- ✻ The cost of machine tools is insignificant in terms of their productive power . . . from 1927 to 1937, according to census reports, American manufacturers had only a total of about 2% invested yearly in machine tools in ratio to a total volume of 9 billion dollars' worth of production annually.

†† **Industrial Par** — *the constantly increasing output per man-hour equal to approximately 50% every 10 years.*

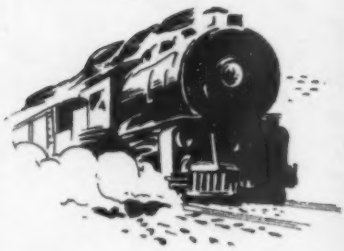


KEARNEY & TRECKER CORPORATION

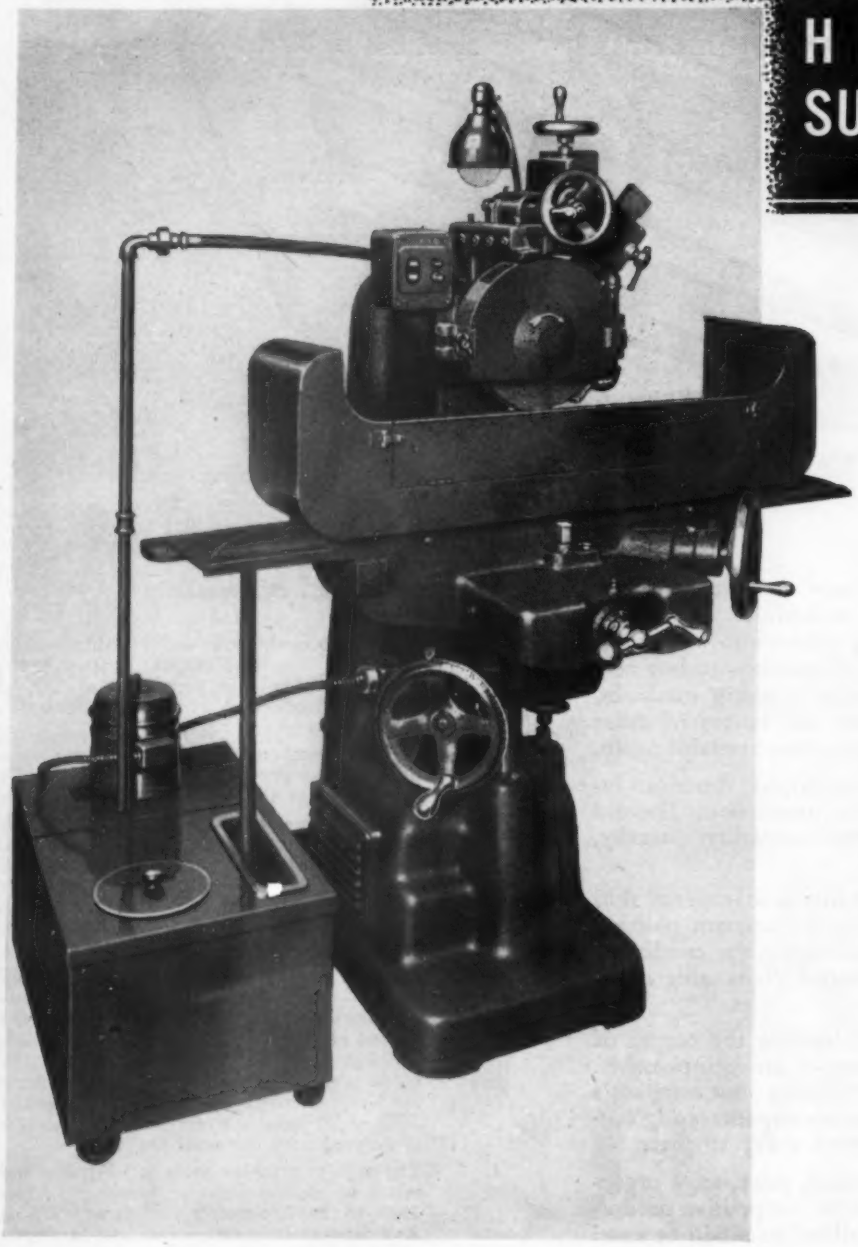
MILWAUKEE 14 WISCONSIN

Let's All Back the Attack! **BUY MORE BONDS**

Milwaukee Machine Tools



Now You Can Get QUICK DELIVERY on COVEL No. 15 HAND FEED SURFACE GRINDERS



To meet demands, production of Covel No. 15 (6″x18″) Hand Feed Surface Grinders has constantly been stepped up. War industries can now get delivery within a few short weeks. . . The great popularity of No. 15 results from its outstanding high-production features — operating ease, quick set-up, clearly graduated convenient controls, clear visibility, rugged dependability and many others which are fully described in Covel's Bulletin A-54. Write, wire or phone today for your copy and name of nearest dealer.

Shorten Employee Training Time With Covel Equipment.

GRINDING MACHINERY SINCE 1874

COVEL INDUSTRIAL GRINDERS

COVEL MFG. CO., BENTON HARBOR, MICHIGAN U. S. A.

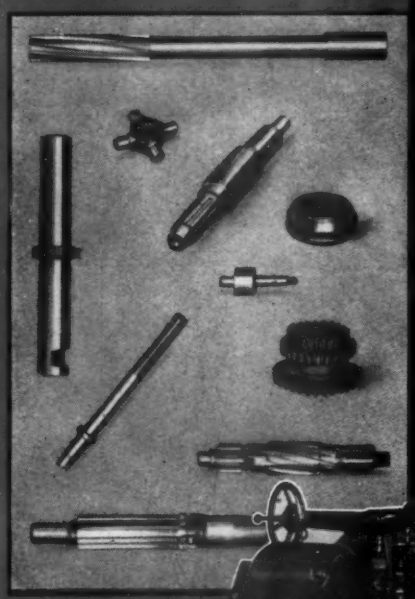
THE FITCHBURG METHOD OFFERS . . . SPECIAL MACHINES FROM STANDARD UNITS

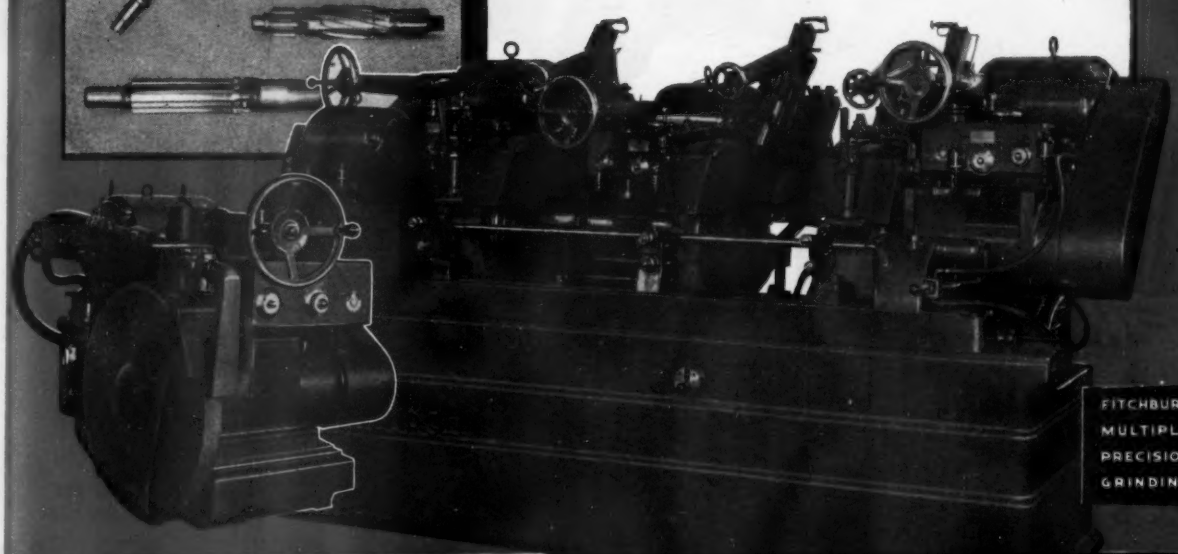
Fitchburg automatic multiple precision grinding offers the same profit possibilities that up-to-date shops now earn with multiple tooling and combined cutting on machined work.

Special machines mounting Standard Bowgage Head Grinding Wheel units, like the one illustrated, enable the precision grinding of two or more dimensions at a single handling. Grinding is completed within the time required for the longest single operation. On mass production work these Fitchburg grinders rapidly repay their cost.

On hundreds of parts like those shown, for machine, automotive or ordinance work, Fitchburg engineers can help you to make sure your orders are filled on time, and at the lowest possible cost. It will not obligate you to mail in your blueprints for study. Catalog shows wide range of other successful applications. Write for a copy today on your business letterhead.

When installing special grinding equipment it is important to remember that the Fitchburg Bowgage Grinding Wheelhead is a self-contained standard unit. It can be remounted on standard machines, or on new special bases, for operations other than the one originally specified. This feature protects your investment.





FITCHBURG MULTIPLE PRECISION GRINDING

FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U.S.A.

Manufacturers of — Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.

CADILLAC
Thread Plug
GAGES

•

ALL STANDARD SIZES

National Fine — National Coarse
0-80 to 1½-6

Also Pipe Plug Gages ⅛ to 1¼

o

WHEN an emergency arises and you need quick delivery of Standard Thread Plug Gages, wire your order to CADILLAC and it will be filled immediately. In fact, except in cases of abnormal demand for a certain size, all orders received by 4:00 p.m. are shipped the same day.

This quick service is made possible because our entire production is concentrated on thread plug and ring gages — and because our plant is equipped with the most modern facilities for producing these types of gages not only speedily but also with an accuracy that meets the highest standards of precision measurements.

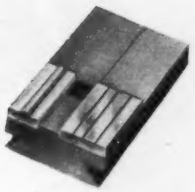
WIRE YOUR ORDER Today!

CADILLAC THREAD GAGES CADILLAC

CADILLAC GAGE COMPANY, *Detroit*

DON'T TIE UP YOUR TOOLMAKER

LET US MAKE YOUR SPECIALS



"SPECIAL" SERVICE

When you need "specials" call in our nearest Field Engineer who is fully qualified to help you. Or... send us drawing, sketch, or blue print with all angles and sizes shown. Specify grade of KENNAMETAL or describe work to be done. If chip breaker is needed, indicate on drawing, or give feed and depth of cut. For complete instructions see our new Tool Manual. If you don't have it, write for your copy today.

When you require form tools and other special shapes for steel-cutting come to KENNAMETAL . . . relieve your toolmakers of a laborious, costly, time-consuming job . . . and at the same time be sure of highest degree of tool performance.

KENNAMETAL special tool service provides the facilities, experience, and skilled personnel that few, if any, machine shops have need for or can afford to maintain. By using this service you obtain the help of a staff of trained tool engineers, whose advice assures you of getting the right grade of KENNAMETAL, properly ground to accurate rake and cutting edge angles.

Next time you need "specials," give the job to KENNAMETAL specialists. Depending on requirements, we will economically and promptly supply either complete tools, or formed tips for brazing to shanks in your own shop. Our Catalog 43-C contains a wealth of information on KENNAMETAL tools for all steel-cutting purposes. Write for your copy.

KENNAMETAL

KENNAMETAL Inc.

103 LLOYD AVE., LATROBE, PA.

SUPERIOR CEMENTED CARBIDES

"Speaking of Tenths"

The war is teaching industry new standards of precision—precision that will be required when peace comes. It is precision to tenths—

"1/10 of 1/1000 of an inch"

The extreme accuracy of *Cleereman* Jig Borers has helped establish the new standards of precision. They will help produce, along with Cleereman Drilling Machines, the finer, more accurate products demanded after the war.

BRYANT MACHINERY & ENGINEERING COMPANY

Associated with **CLEEREMAN MACHINE TOOL COMPANY**

General Sales Offices **400 W. Madison St. • • Chicago 6, Ill. • U. S. A.**

One proposed use for obsolete war planes is for the quick freezing of foods. Cargoes of freshly picked fruits and vegetables may be flown directly from the fields to high altitudes. There the compartments will be opened and the contents immediately frozen by the intense cold.

More than 2,000 varieties of plants have been tested for rubber during the last year.

A resin bonded panel of plywood, with a sprayed coating of steel, has eight times the strength of either material alone.

Electronic hearing devices are now so sensitive that the growing noises of a blade of grass may be heard.

One use suggested for the Helicopter is to carry girders and beams to high buildings or bridges and hold them in place while they are being fastened. This would make derricks, elevators and cranes unnecessary for this purpose.

Magnets are being used by draftsmen to hold drawings in place on steel-cored drafting boards.

Three stages of post-war development in railway locomotives are predicted. First, the high-efficiency turbine, using super-heated steam at 600 to 700 degrees. Second, the oil-burning internal combustion turbine. Third, the same type of turbine with a gas-producer using coal.

A small hand tool now "spot-welds" thermoplastic resins electronically.

So rapid are changes in technology that, for purposes of government bookkeeping, synthetic rubber plants are assumed to become obsolete in five years.

Transparent plastic, reinforced with glass fibers, is being used in aircraft construction. The material is said to have ten times the impact strength of ordinary plastics.

For twenty years people have been laughing scornfully at the "seadromes", 65,000 ton, 10 million dollar islands for transatlantic passenger planes. Now that seemingly fantastic project is being seriously considered by several large steel, shipbuilding and air transportation companies. Supported on floats 160 feet below water and extending 70 feet above the surface, the seadromes are unaffected by waves and would furnish a safe, level landing and refueling place as well as luxurious hotel accommodations.

Steel alloys, whose exact compositions are unknown, can now be quickly identified by the use of a small radio-like apparatus.

The most powerful electric motor in the world has recently been completed. It develops 7,000 horsepower at a speed of 25 r.p.m.

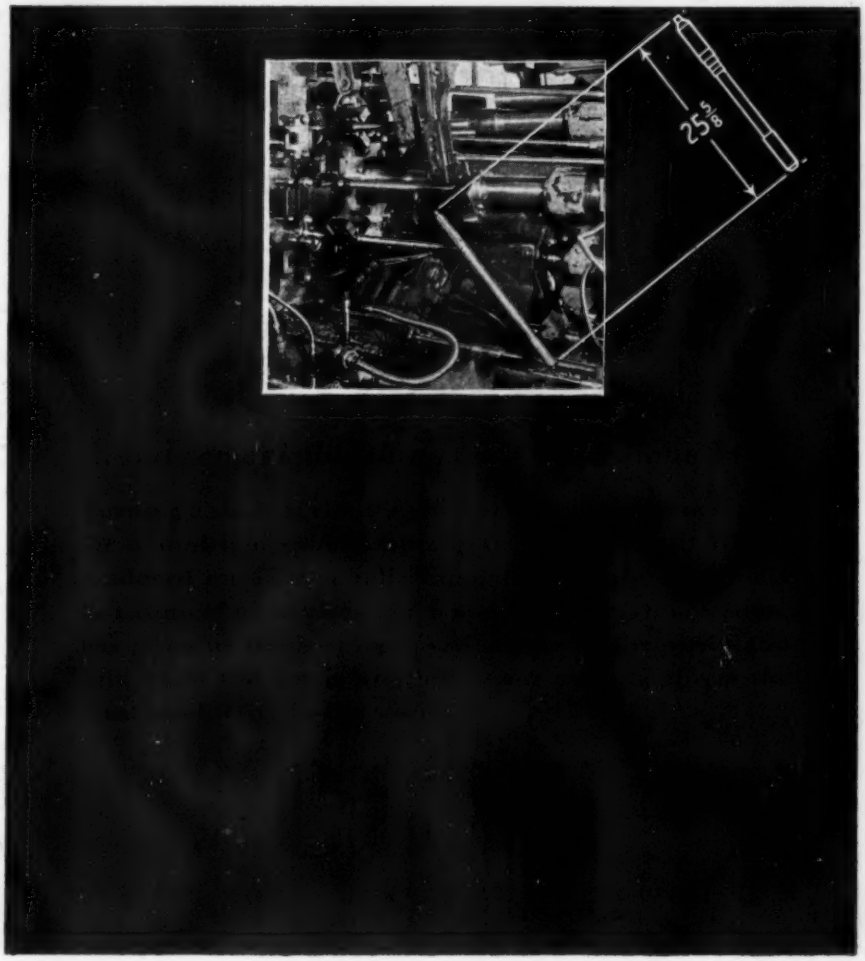
Seventy-two refineries are now making 100 octane gasoline, the production of which has increased 400% in the last year, and is expected to double again in the year ahead.

By the use of a new ultra-high frequency, resonator telephone engineers expect to send six-hundred thousand conversations or television pictures at one time through a six inch pipe.

A new balance will weigh as little as two-hundred millionths of an ounce. The pointer is so tiny that it must be read through a microscope.

The carbon brushes used in the various electric motors of fighting airplanes are small, but vital. A new chemical process is reported to increase their life fifty times, and to prevent breaking down at the low temperatures in which they must operate at high altitudes.

Punched plastic sheets are now being used in place of cedar separators in storage batteries.



ARMSTRONG

Carrying On the Fight

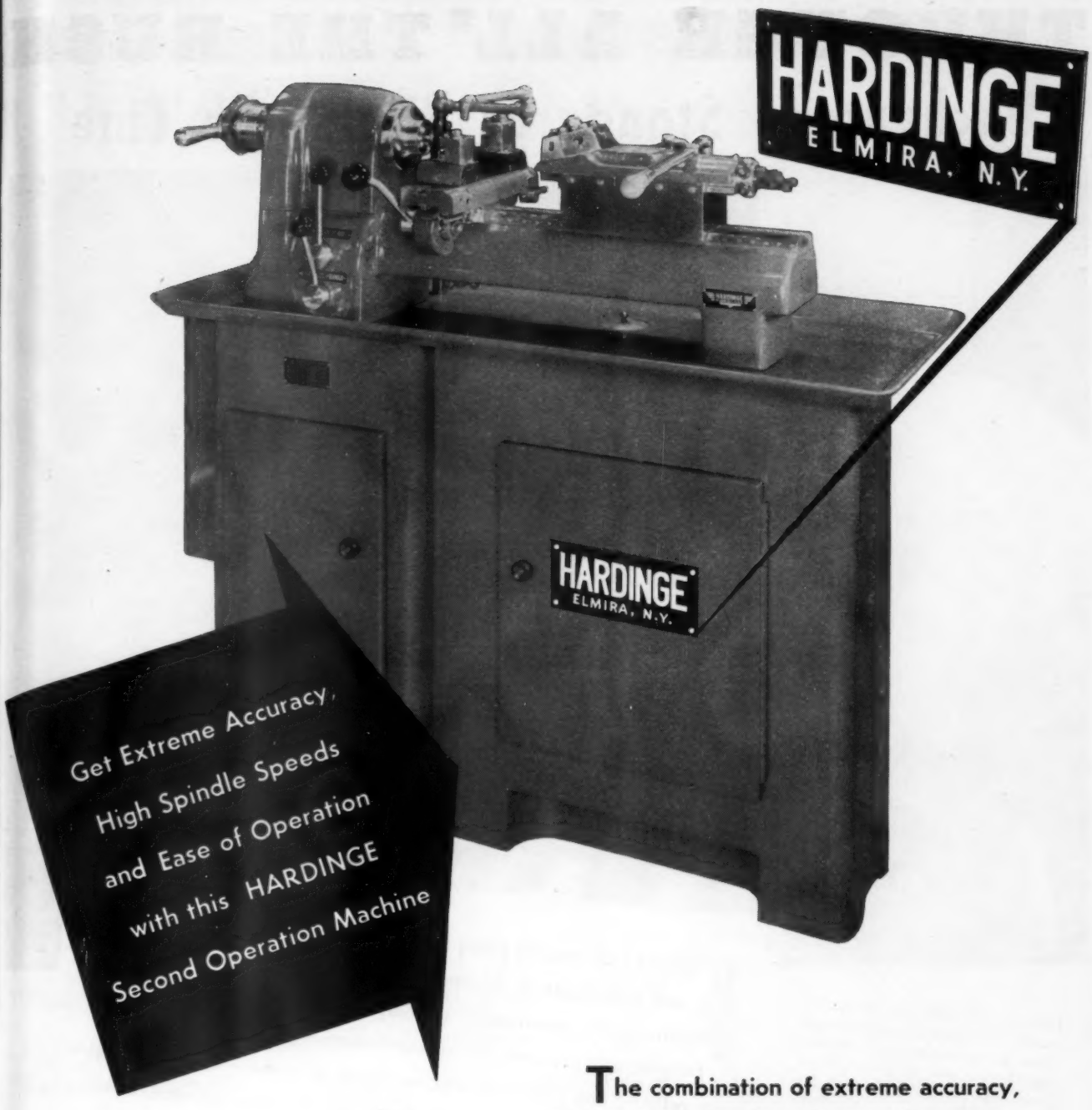
in every home plant and every fighting front

The basic tools for lathes, planers, slotters and shapers used in over 96% of the Machine Shops and tool rooms, ARMSTRONG TOOL HOLDERS are an important factor in America's "battle of production." Their part in this war however, does not stop in the shops and plants of America and its Allies. ARMSTRONG TOOL HOLDERS are standard equipment in the maintenance shops aboard all warcraft and auxiliary ships; are found in all advance base shops and on every front in both the Army's and Marine's Mobilized Machine Shops.

ARMSTRONG TOOL HOLDERS are part of America's Military Strength, of America's superiority in equipment, for wherever used they assure our "fighters" of the most efficient tools obtainable, tools with strength to stand up to any feed and speed, tools that are always ready, that have the stamina to see any job through.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
315 N. Francisco Ave., Chicago 12, U.S.A.
Eastern Warehouse & Sales:
199 Lafayette St., New York

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms



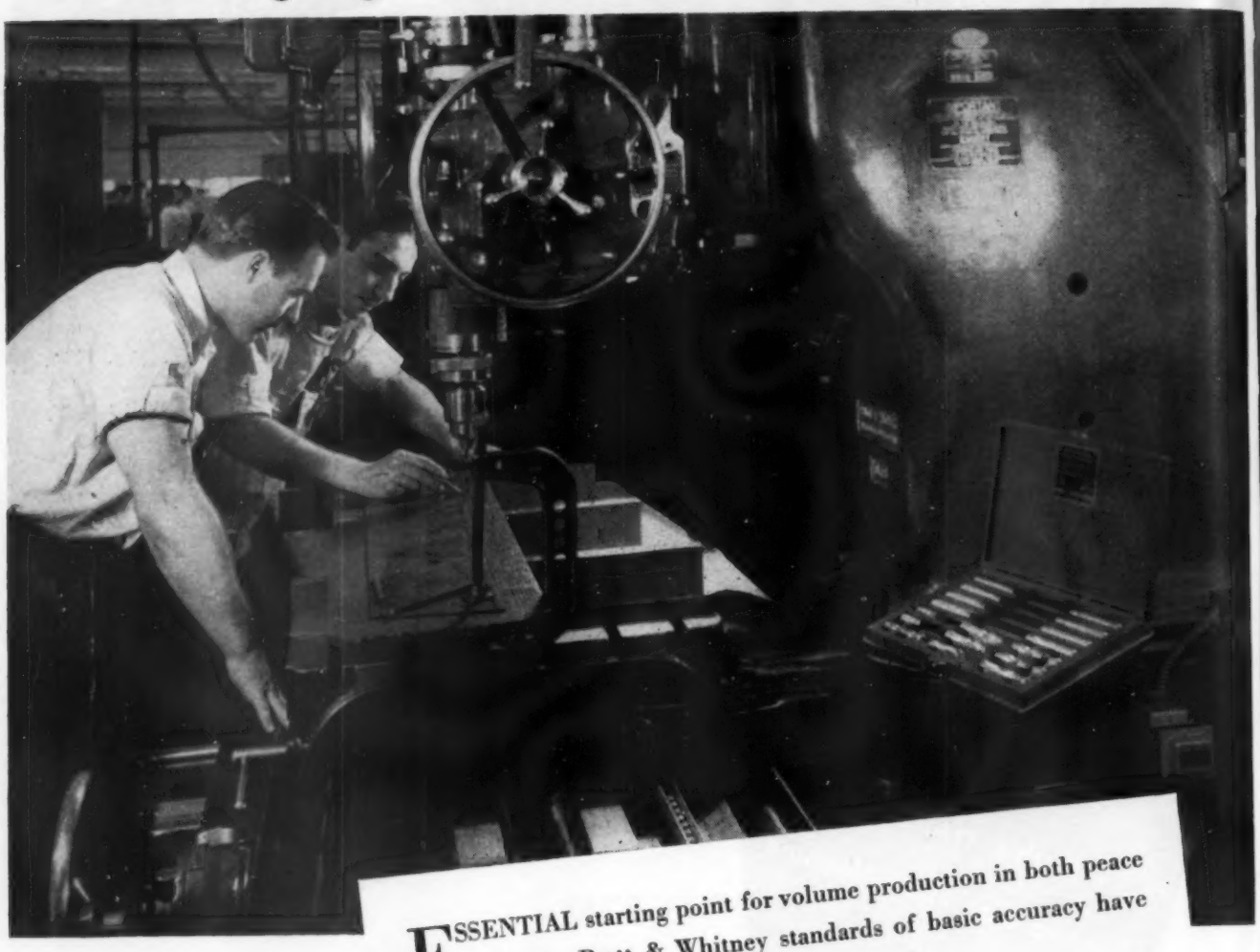
CAPACITY:
1/16" to 1" with collets
1" to 6" with step chucks
1" to 5" with jaw chucks
Spindle Speeds:
100 to 4000 r.p.m.

The combination of extreme accuracy, high spindle speeds and ease of operation means better results under the close tolerances of manufacturing standards both today and in the days to come. The ease and simplicity of operation enables relatively unskilled operators to produce parts to the necessary close limits without expensive tooling.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

THROUGH ALL THE RUSH

Unchanging Standards "Hold the Line"



Pratt & Whitney Jig Borer at work . . . laying the basic ground work for accurate mass production. In war and in peace, these precision machines perform invaluable service . . . produce the jigs and fixtures from which countless other machines and products stem. They also serve as "jig eliminators" on short production runs. Write for details.

ESSENTIAL starting point for volume production in both peace and war, Pratt & Whitney standards of basic accuracy have "held the line"—unchanged, uncompromised.

Despite war pressure for speeded output, P&W standards have not relaxed one iota. There's too much at stake—too many war assembly lines dependent for their speed upon the underlying basic accuracy of machine tools, cutting tools and gages that stem from P&W.

As builders of machines that make machines, P&W will continue to "hold the line" until Victory is won — and then to keep on holding it in the years of world rebuilding that will follow.

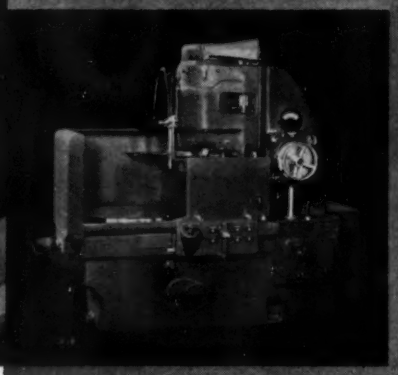
PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD • CONNECTICUT

"PUT IT ON THE BLANCHARD"

BLANCHARD



Grinding Nickel Steel Cams on the No. 18 Blanchard Surface Grinder

These nickel steel Cams are finish ground on the No. 18 Blanchard Surface Grinder.

.040" to .060" of stock is removed from one side of these cams to limits of ±.001". 109 pieces are produced per hour.

This is only one of the many airplane engine parts ground on the Blanchard. Some are held in fixtures; magnetic, hand-clamping or automatic.

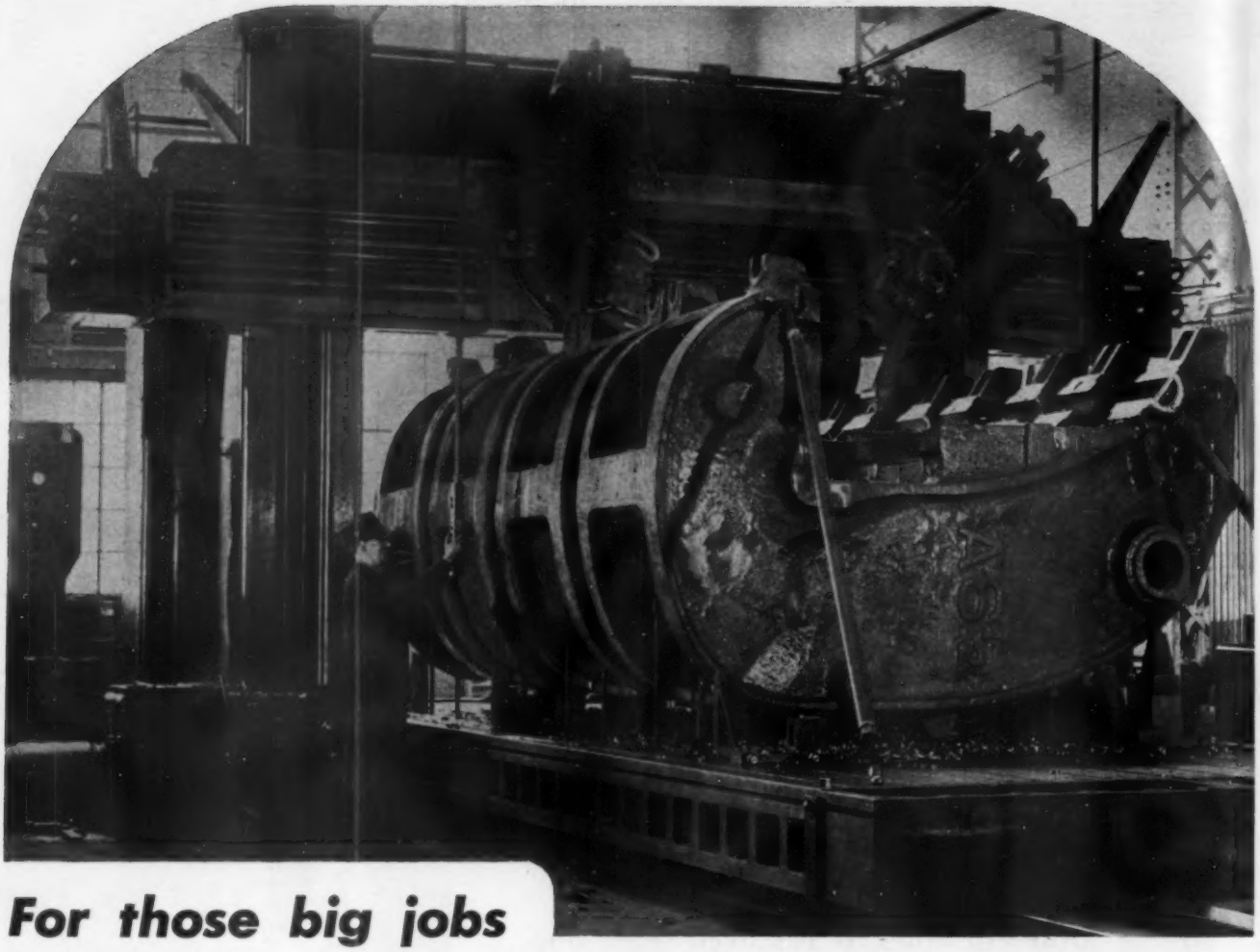
Send your blueprints for production estimates.

The BLANCHARD MACHINE COMPANY
64 STATE STREET, CAMBRIDGE 39, MASS.

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

★ Production
Adaptability
Fixture Saving
Operation Saving
Material Saving
Fine Finish
★ Flatness
Close Limits
★ . . . . . *Especially valuable on jobs like the one illustrated.*

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.



For those big jobs

GRAY *Double Housing Planer*

● Illustrated is a Gray 12 ft. x 10 ft. x 30 ft. Double Housing Planer machining pads on four Niagara Press columns. Note that both heads are cutting simultaneously on the upper and lower pads of all four columns.

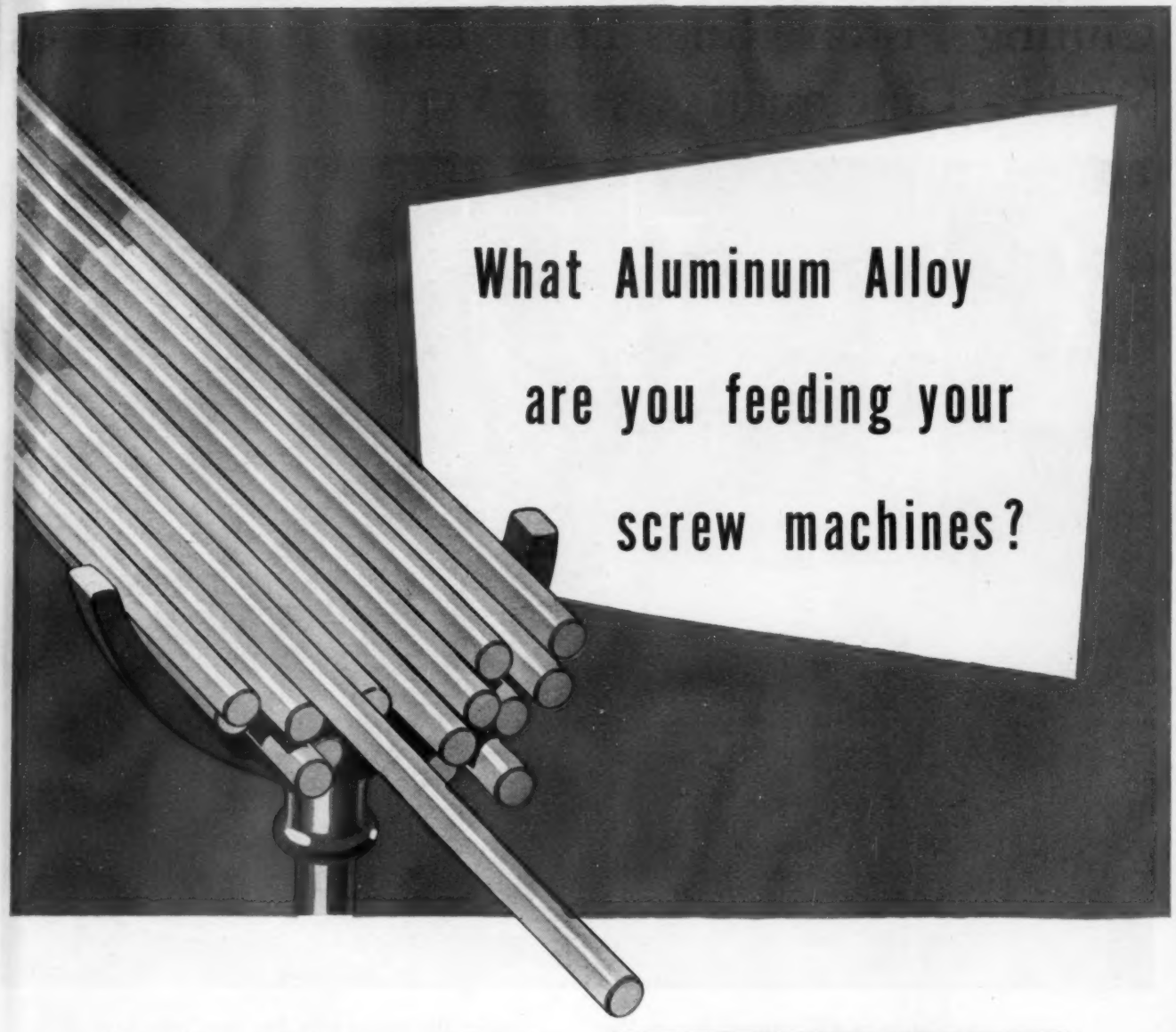
This is typical of the wide range of planer operations being performed daily in hundreds of plants. Dual electric controls facilitate operation from either side of the machine.

A distinctive feature of Gray design is also of great value on this job. Due to the long harp construction, the rail can be clamped close to the work, even when using long reach tools, as the slide can be run up on the harp without sacrificing length of bearing. This insures maximum rigidity and accuracy throughout the length of the cut.

Bulletin 40-R-2 contains complete information on all standard size planers from 36 inch x 36 inch x 10 ft. up to 72 inch x 72 inch x 12 ft. *Write for a copy.*

THE G. A. GRAY COMPANY
Cincinnati Ohio, U. S. A.

THE GRAY LINE — Double Housing and Openside Planers, Switch Planers, Die Block Planers, Double-Housing and Openside Milling Planers, Planer Type Milling Machines, Horizontal Borir. Machines.



Alcoa Alloy 11-S, known as "free-cutting aluminum", was once the standard of many companies for their screw machine products. Then the necessities of war, and the need for maximum output of metal, made it necessary to limit the number of alloys produced. The high strength, but slower machining, 17-S was one of the alloys retained.

Today, production of aluminum has increased to a point where we are again in a position to offer Alloy 11-S. Here is a means, then, if the higher strength of 17-S is not required, of boosting the output of your screw machines: Change over to Alcoa Alloy 11-S.

TYPICAL MECHANICAL PROPERTIES				
Alloy	Yield Strength	Ultimate Strength	Elongation % in 2"	Shearing Strength
17-S	40,000	62,000	22	36,000
11-S	42,000	49,000	14	30,000

Using 11-S or 17-S—all of the usual advantages of aluminum are, of course, retained. You get three times as many pieces per pound, compared to the heavy metals. Resistance to corrosion is inherent in the metal. Aluminum requires no expensive plated coatings, but there are a number of Government-approved finishes for aluminum. For more complete data, write ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh, Pennsylvania.

ALCOA ALUMINUM

Cutting Piston Rings From Large Iron Castings With a Cincinnati Hypro Vertical Boring Mill

The application of a Cincinnati Hypro Vertical Boring Mill for cutting piston-rings from large iron castings for the cylinders of vertical reciprocating steam engines is shown above.

A number of rings are cut from one of these castings. The finished ring can be seen on the right.

The casting is first counter-bored to an inside diameter corresponding to that of the piston groove in which the ring will be fitted by a tool on one of the rail-heads. The tool on the second rail-head is employed to turn the outside of the casting to approximately the cylinder diameter. The sidehead is next used to cut off the ring from the casting to the desired width.

After the piston-ring has been split at one point on a milling machine, the split ends are filed to a high degree of smoothness so as to make them steam-tight when a bronze "keeper" is inserted.

HYPRO is the "short" for HYPRODUCTION.

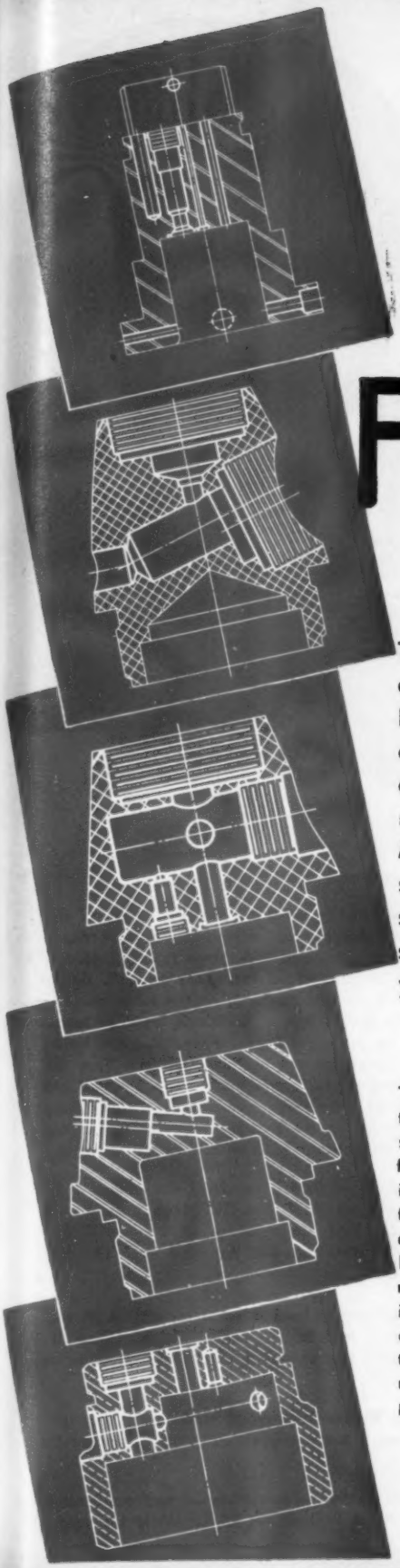
A HYPRO machine tool is your short cut to increased production.

Write for Bulletin 131 just issued describing our latest model Cincinnati Hypro Vertical Boring Mills in the size range from 54" to seven foot widened to eight foot.

THE CINCINNATI PLANER COMPANY

Planers...Vertical Boring Mills...Planer Type Millers

CINCINNATI . OHIO . U.S.A.

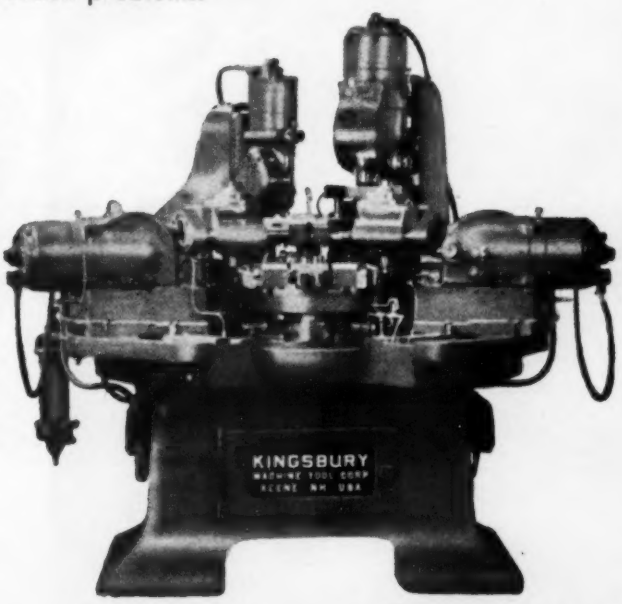


Intricate Fuse Parts Produced with Minimum Number of Chuckings

FLEXIMATIC
by KINGSBURY

The blanks for these shell fuse parts are taken from automatics and completed in from one to four handlings. Kingsbury FLEXIMATICS make it possible to perform in a single chucking a dozen or more highly intricate machining operations on fuse and rifle components and similar parts where speed and accuracy are essential to successful National Defense production. Munitions production presents a three-fold problem . . . high standards of accuracy, pressing production demands and scarcity of skilled labor. Kingsbury FLEXIMATICS provide—in a single machine—the efficient means to solve all three phases of your defense production problems.

The FLEXIMATIC system of construction consist of Standard Units for drilling, tapping, boring, reaming, spotfacing, etc. Mounted on one of several standard bases. This unique method provides a flexible set-up which can be changed over to meet the machining requirements of many different parts.

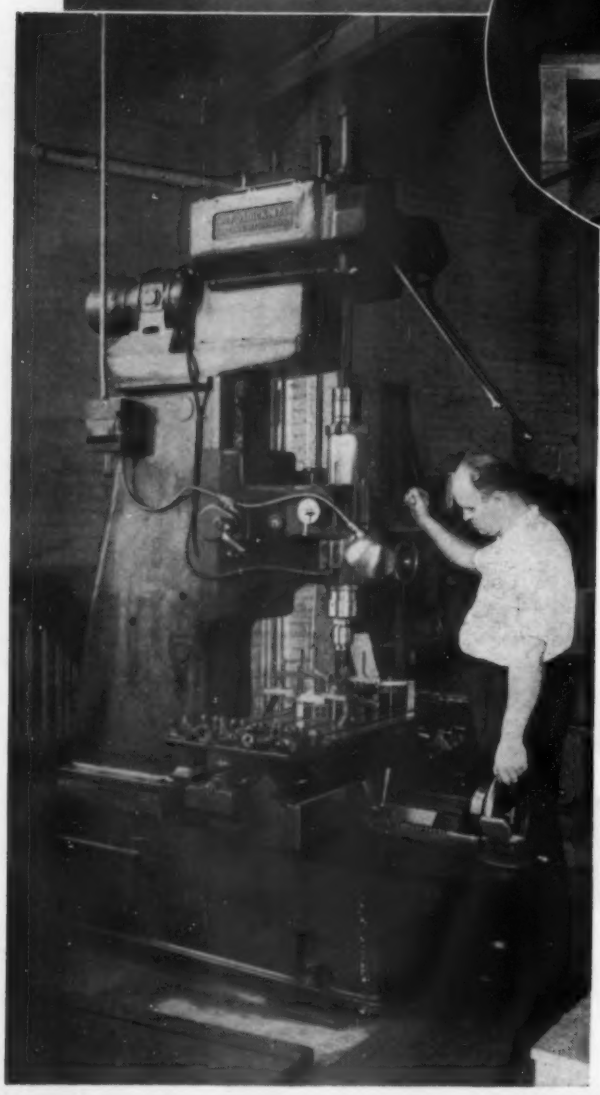


KINGSBURY MACHINE TOOL CORPORATION
KEENE NEW HAMPSHIRE U S A

Simplifies

PRECISION DRILLING, BORING AND TAPPING OPERATIONS

FOSDICK *Jig Borers*



• The Fosdick Jig Borer is ideal for handling a job of this type which requires drilling, boring and tapping operations on a limited number of pieces. The piece is an "Indicator bracket for a ball bearing radial looseness gauge". Set-up is as follows: A sub-plate is mounted on the table containing two bored pin holes, one of which is used to locate from central hole by means of a pin. Four holes are bored and three screw holes spotted in this position. Then the sub-plate is mounted on an angle plate and a second pin inserted into one of previously bored holes. Two more holes are then put in the work at right angles to the first ones and location is determined from the two dowel pins.

Operations performed — Drill 2 — .250" dia. holes, 1 — .625" dia. hole — 1 — .498" dia. ⅞" deep hole and 3 center drill spots — 2nd operation — Drill 1 — 17/64" dia. hole — tap ¼" dia. hole #20 tap — 2 — 5/16" dia. holes #18 tap in line.

Fosdick Jig Borers have gained a wide reputation in tool rooms — tool shops and in production shops where accuracy and flexibility are essential to rapid production at low costs.

Consult a Fosdick Engineer on your work and the possibilities for handling it more economically on a Fosdick Jig Borer.

Full details of construction — operation — and application are found in Jig Borer Bulletin — J.B.A. Write for yours.

FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ··· OHIO

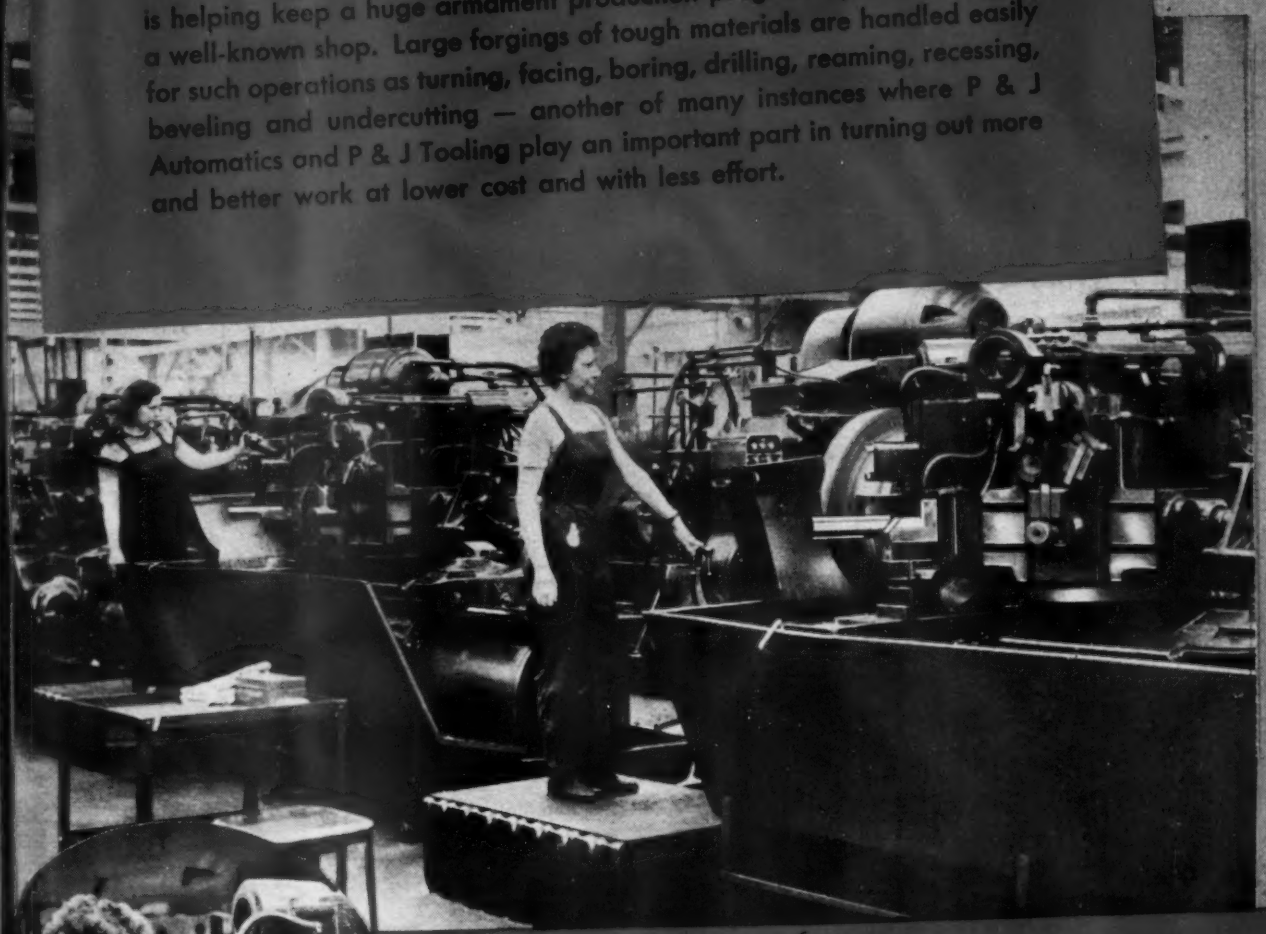
"The Hand that Rocks the Cradle"

KEEPS PRODUCTION ROLLING EASILY...ON

P&J AUTOMATICS

Convenience and easy operation of P & J Automatic Chucking Machines are being demonstrated in many war-busy plants where women workers are handling vitally important production on these fast, accurate machines. Shortage of manpower, therefore, need not be a handicap in plants where P & J machines are on the job.

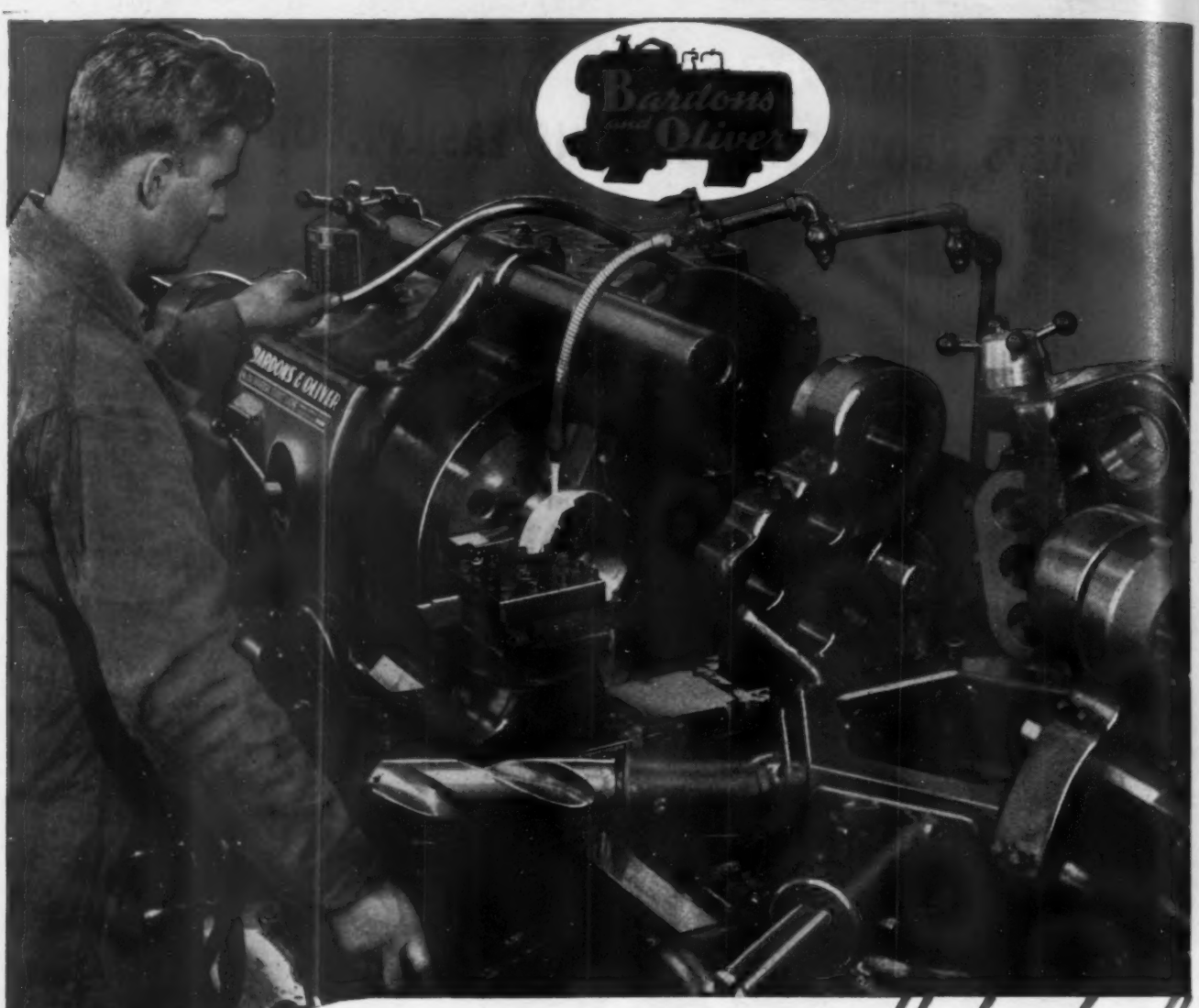
The battery of P & J 8D Automatics with women operators shown here is helping keep a huge armament production program up to schedule in a well-known shop. Large forgings of tough materials are handled easily for such operations as turning, facing, boring, drilling, reaming, recessing, beveling and undercutting — another of many instances where P & J Automatics and P & J Tooling play an important part in turning out more and better work at lower cost and with less effort.



The POTTER & JOHNSTON MACHINE COMPANY

Pawtucket, R. I.

Bonds will Buy Airplanes Today—
and . . . Automobiles Tomorrow



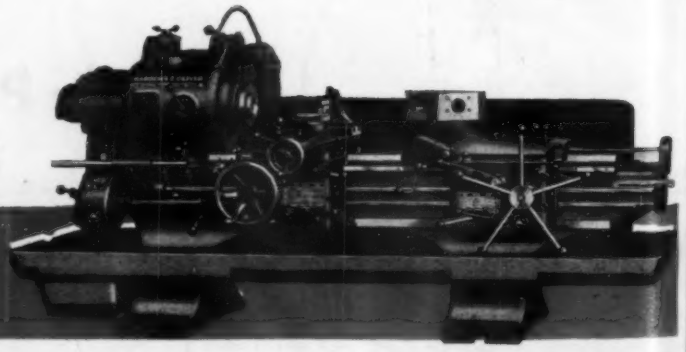
CHANGING THE SPINDLE SPEED *Hydraulically*

Requires merely a gentle pressure on the control lever. Thus this operator is able to turn out a full day's production of alloy steel gear blanks and yet conserve his energy.

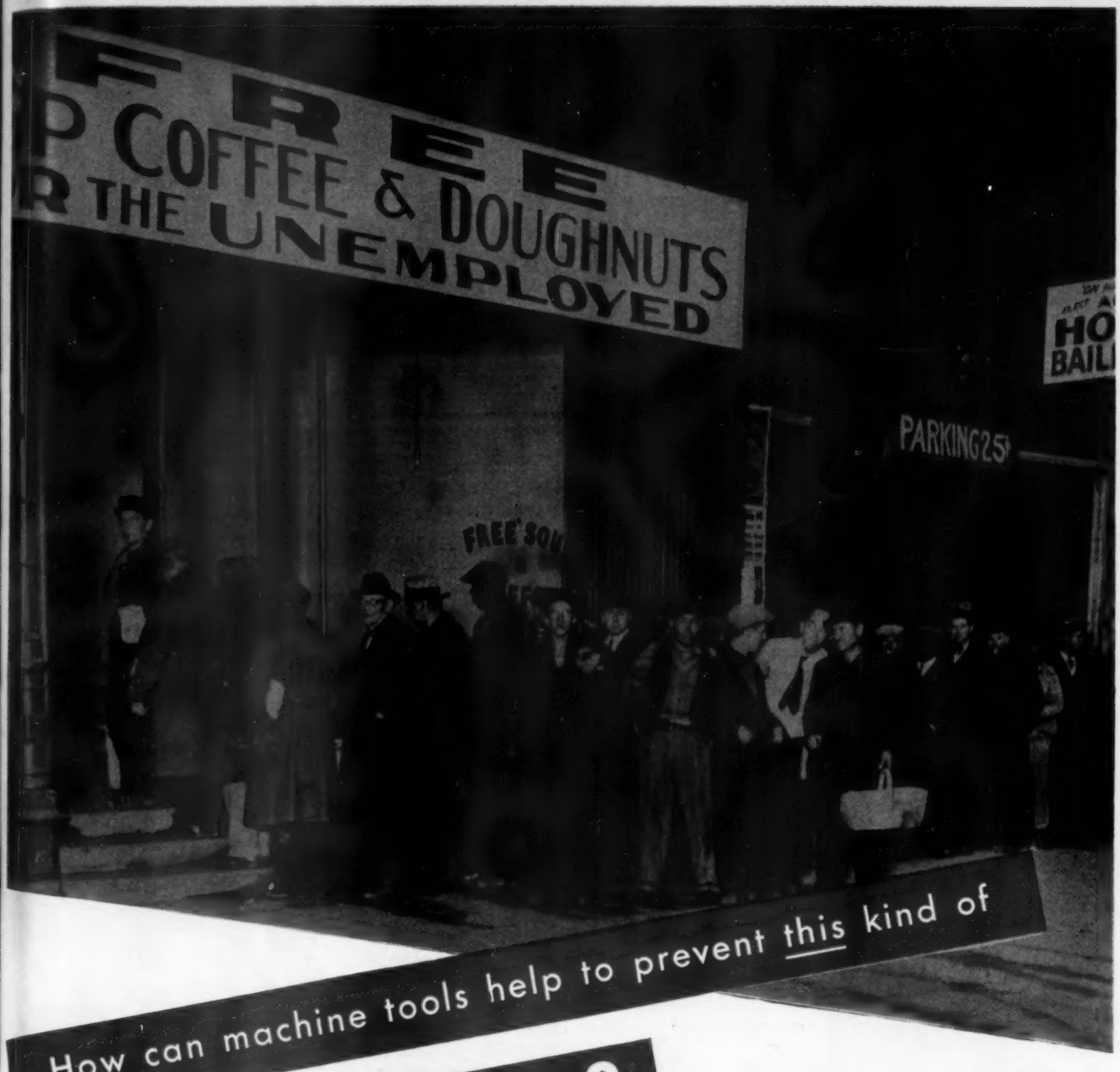
By easy motions of his left hand on the control lever the operator can start, reverse or stop the spindle, or change to any of the twelve available speeds. A powerful hydraulic brake applied in the neutral lever position brings the spindle to a rapid stop. An automatic lever lock prevents accidental starting.

BARDONS & OLIVER NO. 21 SADDLE TYPE UNIVERSAL TURRET LATHE is powerful, rigid and capable of high production. Yet it is outstandingly easy to operate.

Write for a catalog today.



BARDONS & OLIVER, INC.
[illegible] STREET • CLEVELAND 13, OHIO



How can machine tools help to prevent this kind of Victory?

Remember the big parade of the breadline— the march of the bonus army — the victorious men selling apples? Many an American hero tasted those bitter fruits of victory, and the war to end war ended nothing.

What kind of victory will this one be? It *can* be the great one American boys are giving their lives for — but they alone can't make it so. For victory in peace, as in war, must be planned ahead . . . and in peace, *you're* one of the Generals.

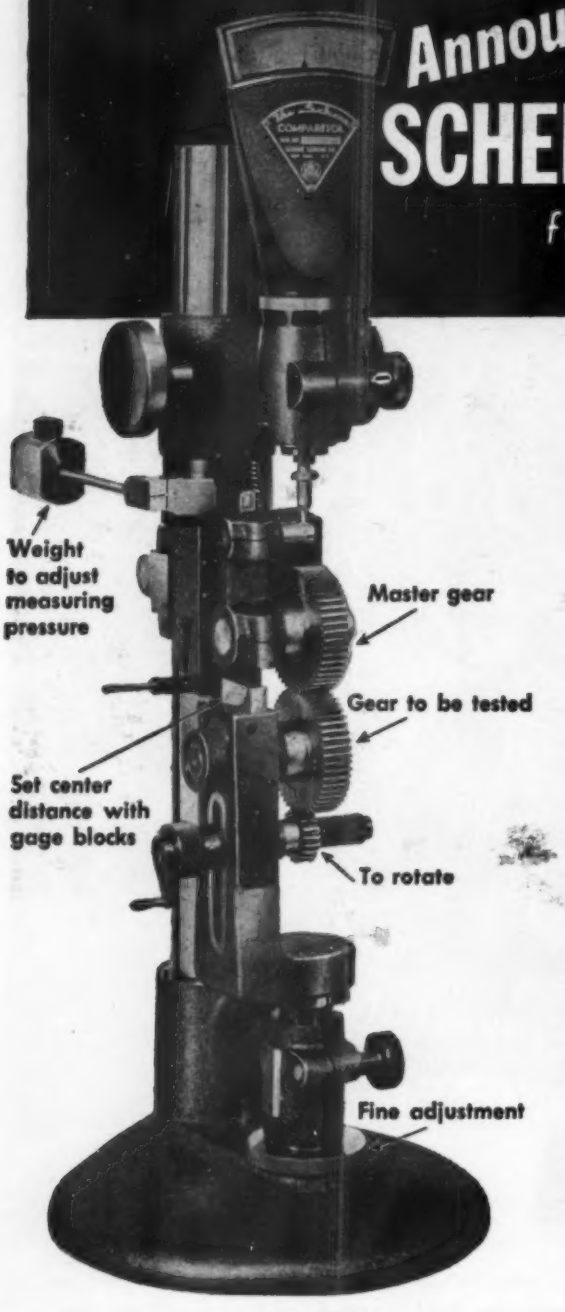
If you are a manufacturer, there is a small group of basic machine tool engineers who can help you to plan now for the kind of victory we've told our sons they're fighting for.

One of these engineers is a Bryant man. We urge you to call him today. For his specialized knowledge of internal grinding machinery is important to the manufacture of literally *everything* that will make this country a finer place: this victory a victory that we shall not be ashamed of

BRYANT CHUCKING GRINDER COMPANY SPRINGFIELD VERMONT, U. S. A.

Announcing the NEW SCHERR Comparitol GEAR TESTER

for fast, accurate inspection of precision gears

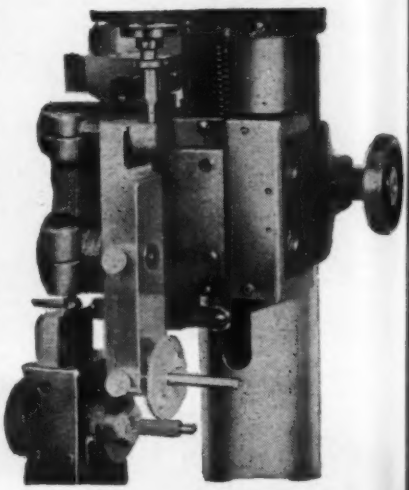


With the new SCHERR COMPARITOL GEAR TESTER, faults in gears can be easily and accurately detected. Center distance is quickly checked by setting up the instrument to proper distance with gage blocks or other standards. The master gear against which gears are checked is placed on an arbor and the gear to be inspected on another arbor so that it is directly in contact with the master. Pressure between master gear and tested gear is uniformly maintained by an adjustable counter-balance on the master gear bracket. A handle operating a pinion engaging the gear under inspection is used to rotate the gears.

Any divergence or error is quickly shown by readings in the Comparitol dial head. Depending on the class of work and precision required, it is possible to read to .001, .0005, .0025 or .0001". A wide range of gear sizes can be inspected, because the Comparitol Gear Tester provides a variation in center distance from 1" to 6".

Typical uses include: checking of rolling action between two working gears or gear and pinion; detection of gear eccentricity, variation of tooth thickness, involute errors, and off-center teeth. The Scherr Gear Tester can also be employed to check gear assemblies by giving indication of any run-out.

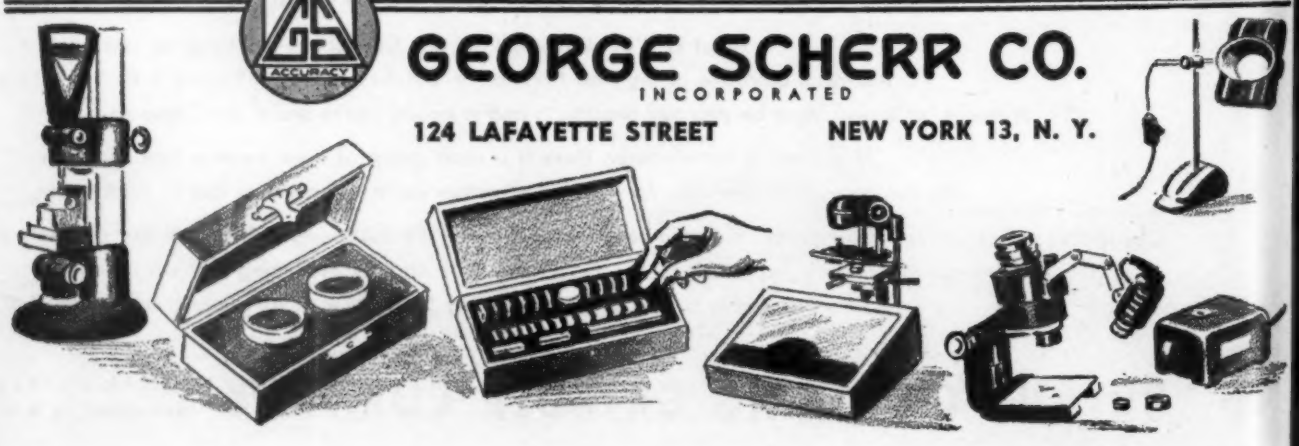
Write at once for complete details of the NEW SCHERR COMPARITOL GEAR TESTER.



Special attachment for Gear Tester for checking very small gears and pinions such as are used in instrument gearing. With this attachment gears down to ¼" center distance can be accurately checked.

GEORGE SCHERR CO.
INCORPORATED

124 LAFAYETTE STREET NEW YORK 13, N. Y.



A COMBINATION FOR *Precision*

This Atlas Bench Lathe with its Timken Bearing Equipped Spindle —free-turning, smooth, rigid, chatterless; and the keen-eyed, steady-handed operator, form a team that keep both precision and production at a constantly high level in the manufacture of dies for cold heading machines. Precision knows no limitations of size when spindles are mounted on Timken Tapered Roller Bearings. Thus, the smallest bench machine can be as precise in performance as the largest tool room equipment. Make sure you have Timken Bearings in any new machine you buy—large or small; then you'll be sure of precision now and for years to come. The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

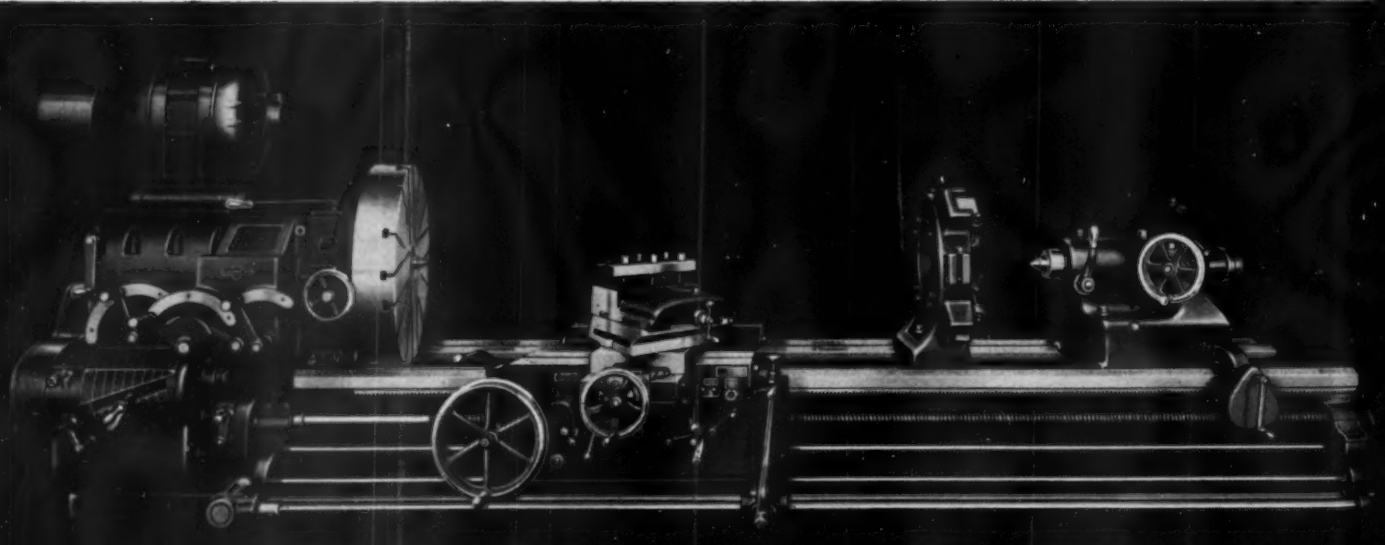
Speeding Deliveries TO THE AXIS!

"American" Lathes are doing a real speed-up job in producing torpedoes for "delivery to the Axis".

Here is one of a battery of 42" "Americans" machining torpedo air flasks with eight tools cutting simultaneously. This job demands power and stamina far in excess of the average lathe job. "Americans" were selected—"Americans" are doing the job.

The Amertorp Corporation, one of the world's largest and finest torpedo manufacturing plants, employs many "American" Lathes for a great variety of torpedo machining operations.

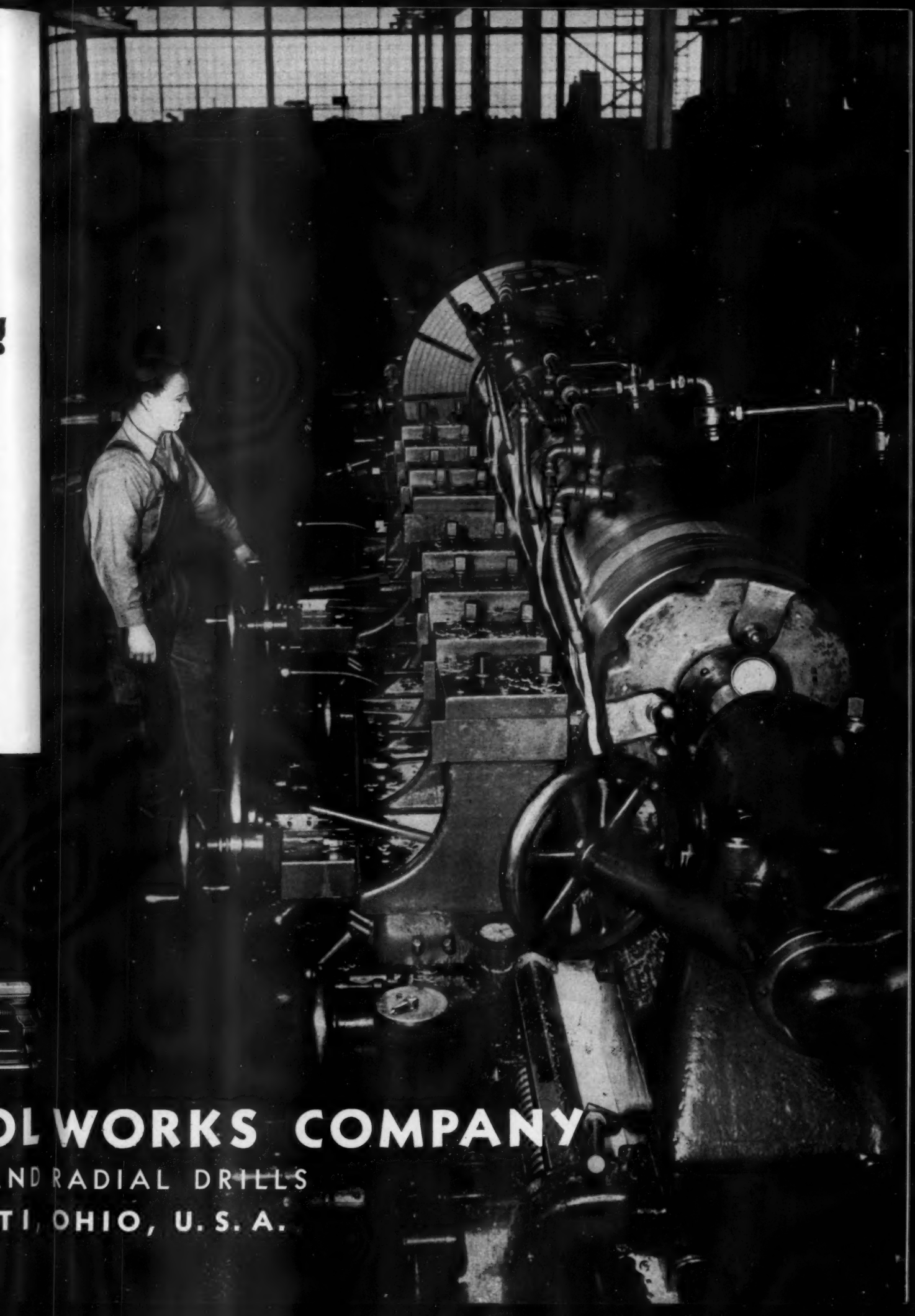
We are proud of the part "American" Lathes are playing in the production of this masterpiece of destruction.



THE AMERICAN TOOL W

LATHES AND RA

CINCINNATI, OH



OL WORKS COMPANY

AND RADIAL DRILLS

TI, OHIO, U. S. A.

Broaching by *American*

PROVEN in war . . .

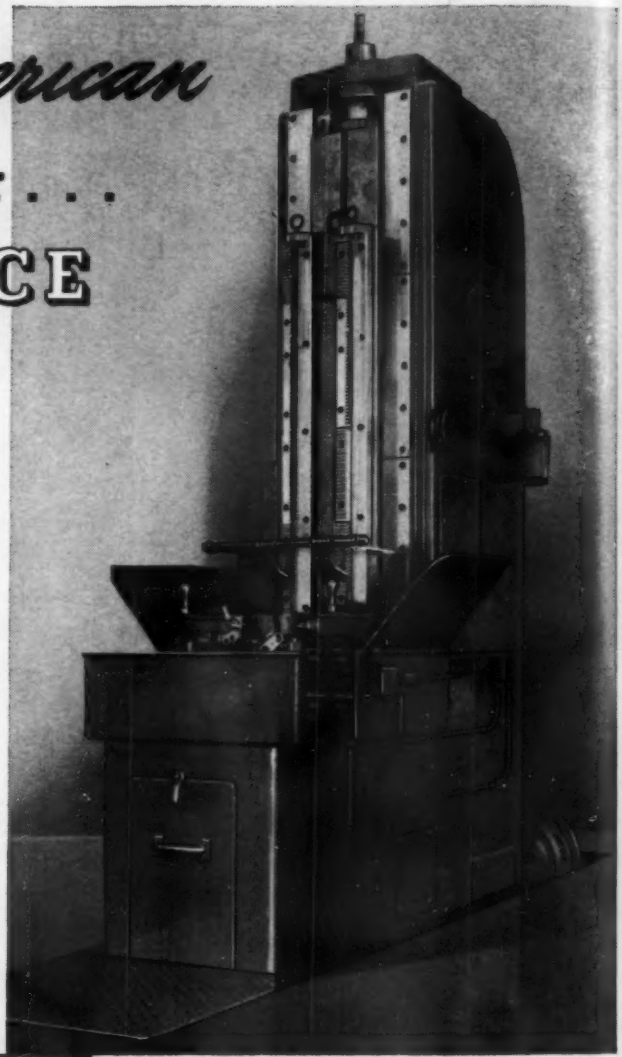
Ready for PEACE

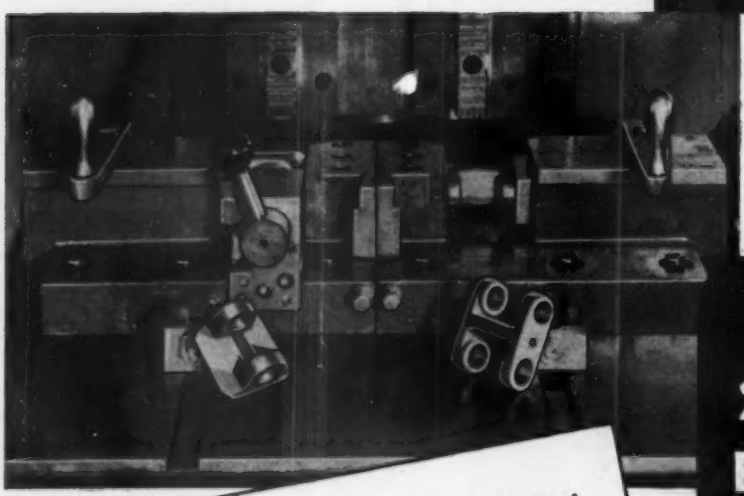
When war's demands made necessary precision production on a mass production basis, many leading production engineers turned to broaching—by *American*.

A typical example: finishing the surfaces between the bosses on aircraft universal joint parts. American Broach and Machine Company engineers—identified with broaching since the turn of the century—assumed responsibility for complete broaching equipment for this job. An *American* SB-54-10 single ram machine with receding work table was provided, equipped with a two station fixture designed to broach two end parts and one center part for a balanced production in each two machine cycles. (See illustration below.)

This is but one of the many war jobs where broaching by *American* is providing faster, more accurate and more economical production. When production planning is undertaken for peacetime products, *American's* complete service—machines, tools, and engineering—will be available.

Broaching is better the *American* way — proven in war, ready for peace!





(Above) *American* SB-54-10 Machine. Loading and unloading are synchronized with the machine cycle so that down time is zero . . . production high . . . finish excellent.

(Left) Parts broached in this operation are shown installed in the fixture, with two completed parts lying on the front of the table.

Use proper and sufficient lubrication when broaching. It is cheap life insurance for broaching tools.

American

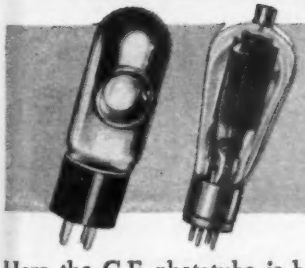
BROACH AND MACHINE CO.

ANN ARBOR, MICHIGAN

•

BROACHING MACHINES
PRESSES
BROACHING TOOLS
SPECIAL MACHINERY

DIVISION OF



The G-E phototube and G-E thyratron are the electronic tubes used in synchronizing the operation of this packaging machine.

Here the G-E phototube is being used in a photo-electric relay control—to eliminate cumulative errors in label-cutting register caused by slippage, shrinkage or stretching of paper. It makes possible the use of a continuous web of paper (instead of individual precut sheets) with complete accuracy.

As the web rolls through the processing machine, the phototube scans the margin for the register marks, and—in co-operation with the thyratron tube—gives the command to "CUT" at precisely the right instant. (Subsequent operations of the machine wrap and package the individual sticks of gum.)

The G-E phototube is exceptionally versatile. It can operate with transmitted or reflected light; on transparent, opaque, dull, glossy, shiny, or colored material. . . . Its applications in counting, sorting, and inspection jobs are unlimited.

The phototube is only one of a complete line of G-E electronic tubes now working for industry on innumerable jobs and many kinds of machinery. It is the purpose of G-E electronic tube engineers to aid any manufacturer of electronic devices in the application of tubes. Through its nation-wide distributing system, General Electric is also prepared to supply users of electronic devices with replacement tubes.

"HOW ELECTRONIC TUBES WORK"

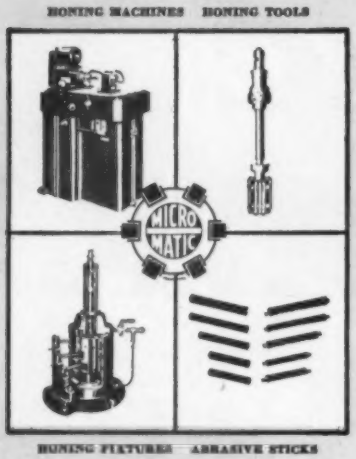
This booklet will be mailed to you *without charge.* Its 24 pages are interestingly illustrated and written in easily understood language. Shows typical electronic tubes and their applications. Address *Electronics Department, General Electric, Schenectady, N. Y.*

• *Tune in* "The World Today" *and hear the news direct from the men who see it happen, every evening except Sunday at 6:45 E.W.T. over CBS. On Sunday listen to the G-E* "All Girl Orchestra" *at 10 P.M. E.W.T. over NBC.*

G.E. HAS MADE MORE BASIC ELECTRONIC TUBE DEVELOPMENTS THAN ANY OTHER MANUFACTURER

GENERAL ELECTRIC

Honing *shared in converting yesterday's "PRIDE OF THE FLEET" into the* MODERN ECONOMICAL TRUCK CARRIER



Yesterday—*Called "slave ships" and "kidney busters" by drivers, yesterday's trucks were hard to drive, costly to operate, and required almost constant service. But with all their crudities, they inaugurated a new era in highway transportation and distribution of goods. Grinding—an early process of controlled abrading—made them possible.*

Today—The powerful modern carrier has higher speed, maximum economy, long periods between overhauls, easy maintenance, a high pay-load factor—the goal of yesterday's builders. HONING, the modern, controlled abrading process, helped engineering design and production achieve this mechanical triumph.

Tomorrow—Today's tough military service and maintenance will be projected rapidly into commercial and industrial use. The competitive movement of bulk-weight shipments will require greater and greater operating efficiency.

In the mechanical refinements to come, HONE ABRADING processes developed by Micromatic will be ready to play a most important part.

MICROMATIC

HONE CORPORATION

Detroit, Michigan

MAKERS OF HONING MACHINE TOOLS

Army Transport Now Races
On Honed Working Surfaces

Only yesterday army trucks crawled briefly between breakdowns—because of poor bearing surfaces. Modern carriers—trucks, tankers and prime movers have to be tough to stand the continuous service under heavy going.

They now race dependably on accurately honed working surfaces. Speed and time between overhaul have been multiplied. They are better because of their precision bearing surfaces. Honing assures this surface quality, and eliminates loose bearings, inaccurate fits, fatigue cracks, and other enemies of durability.

Microhoning—the modern abrading process—removes stock at rates up to 65 cubic inches per hour—generates accuracy for roundness and straightness of bore within .0002″ to .0003″ and any desired surface finish.

Trucks — planes — tanks — jeeps — ordnance — ships — Microhoning has many applications in war . . . and many more in peacetime use. Write for Bulletin A. R. 67.

Some Microhoned Heavy Vehicle Bores

Gas and Diesel Engine Cylinder Bores and Sleeves

Connecting Rod Bores (Large End)

Valve Guide Bores

Diesel Fuel Injector Bores

Shock Absorber Bores

Brake Cylinder Bores

Transmission Gear Bores

Ditching Machine Planet Gear Bores

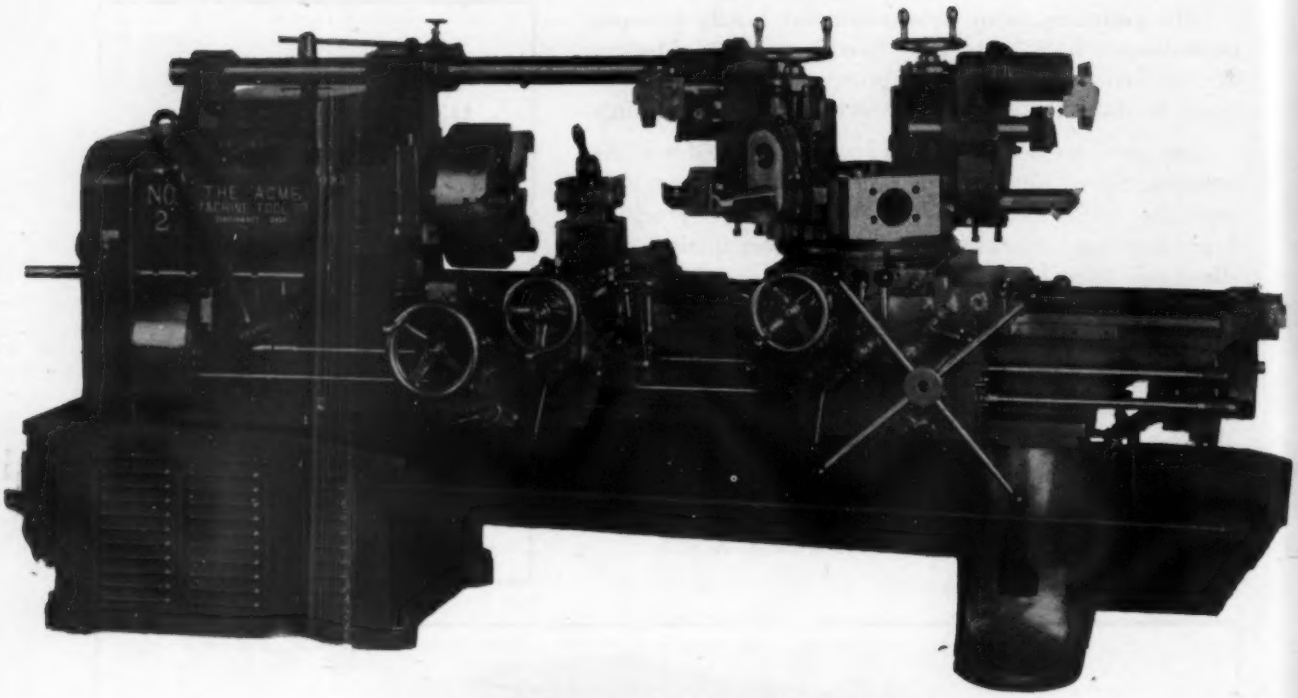
Roller Tooth Steering Sectors and many other parts.

Courtesy Mack Truck

MICROMATIC HONE CORPORATION

DETROIT, MICHIGAN

THE NO. 2
ACME
TURRET LATHE



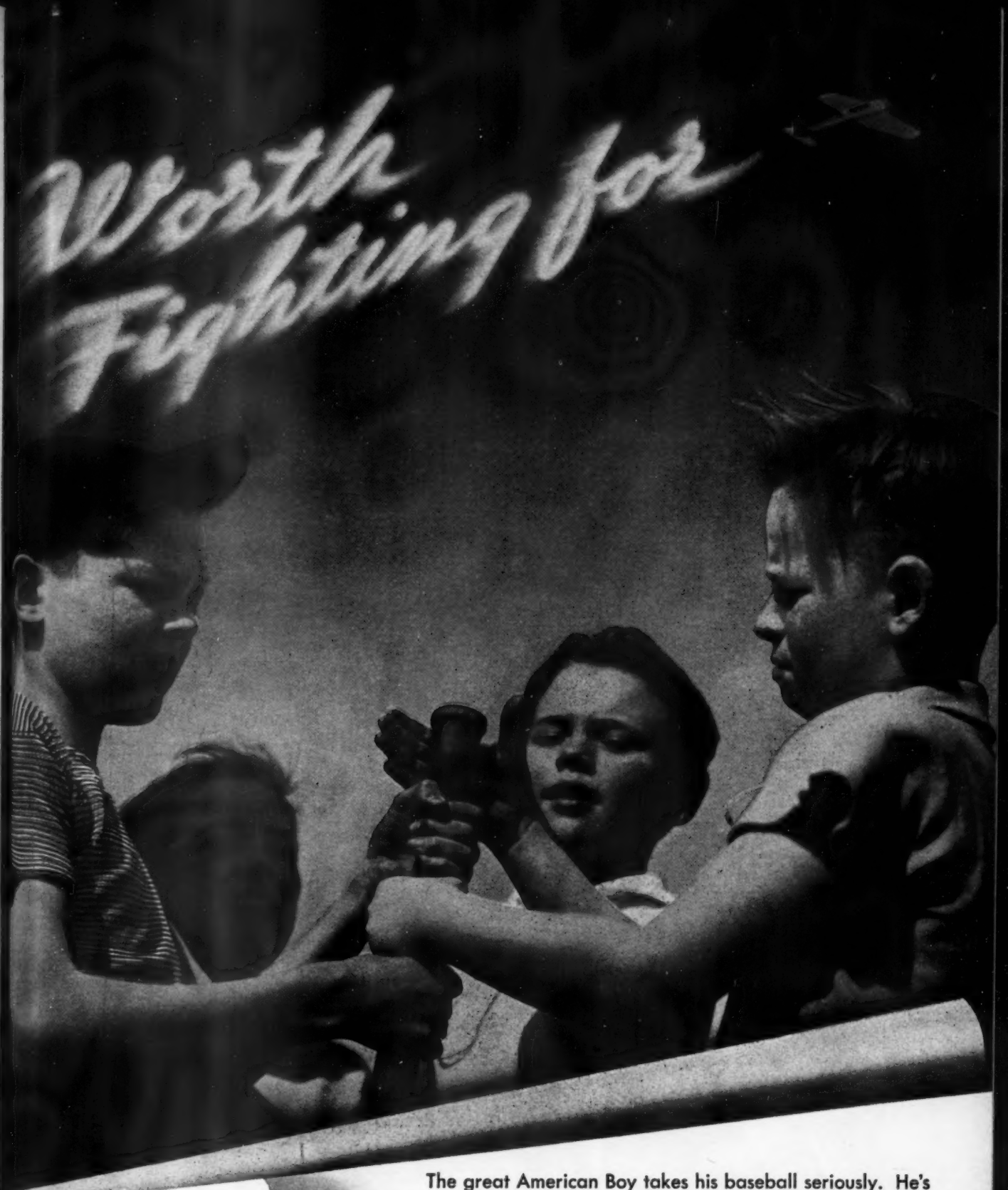
...A VERSATILE MACHINE
QUICKLY ADAPTABLE TO POST-WAR OPERATION

● The wide variety of work that can be handled on this machine — the ease with which it can be tooled for new work — makes it ideal for many of the jobs that are being planned now for future production.

Its sturdy, rugged construction assures ample strength and power for the high speeds and feeds required with carbide and other high production tools. Its compact design enables the operator to secure high production with minimum fatigue and to maintain close limits of precision.

The No. 2 machine shown has a 3½" round bar capacity and will swing 20½" over the bed.

The ACME MACHINE TOOL CO.
... CINCINNATI, OHIO.



Precision Built . . . Machines Since 1888

KEMPSMITH

KEMPSMITH MACHINE COMPANY • MILWAUKEE 14, WIS., U. S. A.

The great American Boy takes his baseball seriously. He's out there to WIN! And to help win, he knows he must STAY IN THE GAME! We, on the production front, should display that same fighting spirit. We, too, have a "game" to win . . . the more gruesome game of War! And victory will be ours only if we apply teamwork . . . work hard and faithfully . . . above all . . .

STAY ON THE JOB!

8 HOURS "OVERTIME" FOR TOOLS *Free!*

SUNOCO
EMULSIFYING CUTTING OIL

PERMITS 20% LONGER TOOL LIFE . . . CHECKS RUST

Plus production will win the war . . . the kind of plus production made possible by cutting tools staying on the job longer than usual, as they did in this plant when a change was made in cutting oil.

Extra output was being retarded because of frequent tool changes . . . rusting of machined parts . . . and a tendency of the oil toward rancidity. A Sun Cutting Oil Engineer studied the conditions and recommended a change to Sunoco Emulsifying Cutting Oil.

Tool life increased up to 20% — the equivalent of 8 extra hours in every 40-hour week — when they switched to Sunoco. Sunoco also proved to be an effective rust inhibitor, solving their rusting problem . . . and showed no tendency toward rancidity.

Production increased per machine tool unit in this plant . . . and in thousands of other plants where Sunoco has been put on the job. Its high heat-absorbing and rust-preventing characteristics, plus outstanding stability, make possible longer tool life . . . increased production . . . smoother finishes . . . closer tolerances.

Call a Sun Cutting Oil Engineer to show you the advantages of Sunoco Emulsifying Cutting Oil as applied to your own plant. Write

SUN OIL COMPANY · Philadelphia 3, Pa.

Sponsors of the Sunoco News Voice of the Air — Lowell Thomas

SUNOCO

SUN INDUSTRIAL PRODUCTS *HELPING INDUSTRY HELP AMERICA*

a world did you say?

That's young America speaking. Are we thinking and living in our past? Or are we staying young for and with our kids? Stop! Look! Think!

Remember when you could name the various makes of automobiles as fast as they flashed by? Your boy can do the same . . . with airplanes. You played with toy electric trains. Your youngster builds model gliders. You and your gang thought you were "hot stuff" when you owned and drove a jalopy Model T. Your son looks forward to membership in a flying club and part ownership of a cozy cabin plane.

That lad with the little red wagon and sand bucket has grown up. Today, he is winning a war for us. What will we have ready for him when he returns to "peacework"? When war production at any cost gives way to product production at lowest cost? He'll be deserving of a good turn, then. In lathes, it's LeBlond. They turn at a profit as they true a product.

THE R.K. **Le BLOND** MACHINE TOOL CO., CINCINNATI, 8

NEW YORK 13, 103 Lafayette St. CAnal 6-5281

CHICAGO 6, 20 N. Wacker Dr. STA 5561

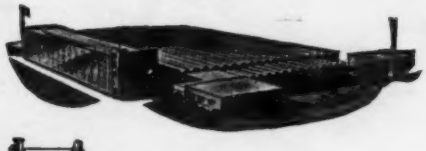
time to retool

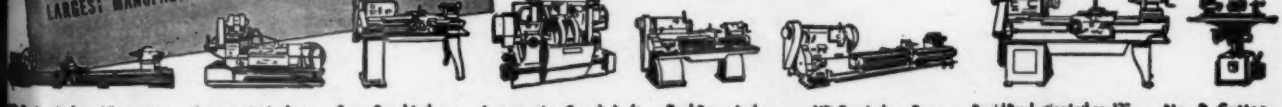
Turn to Le Blond for Turning Equipment

LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES

ARMY E NAVY

LE BLOND





HD Engine Lathes—Nine sizes ranging from 12" to 50" swings. For versatility in turning.

Automatic Lathes—12" & 16" Mechanical or Hydraulic power.

Super Regal Lathes—Six sizes, 13" to 24" best for training.

Automatic Crankshaft Lathes—For all facing, turning, finishing, pins.

Tool Room Lathes—12", 14", 16" and 18" swings. Versatile.

HD Gap Lathes—Ten sizes in Regular and Sliding Gap models.

Rapid Production Lathes—13", 17", 20" swings. Six speeds. Faster output. Lower cost.

No. 2 Cutter Grinder—Internal, cylindrical, face and angular work.

Check-Clip-Mail

FOR ILLUSTRATED SPECIFICATIONS:

- ☐ HEAVY DUTY GEARED HEAD ENGINE LATHES
- ☐ TOOL ROOM LATHES
- ☐ AUTOMATIC LATHES
- ☐ HEAVY DUTY GEARED HEAD GAP LATHES
- ☐ SUPER REGAL GEARED HEAD LATHES
- ☐ RAPID PRODUCTION LATHES
- ☐ AUTOMATIC CRANKSHAFT LATHES
- ☐ No. 2 CUTTER GRINDER

YOUR NAME _____ TITLE _____

YOUR FIRM _____ ADDRESS _____

★ YOUR BONDS BUY BOMBS ★

BUY A "BLOCK-BUSTER" TODAY!

SPEED UP PRODUCTION

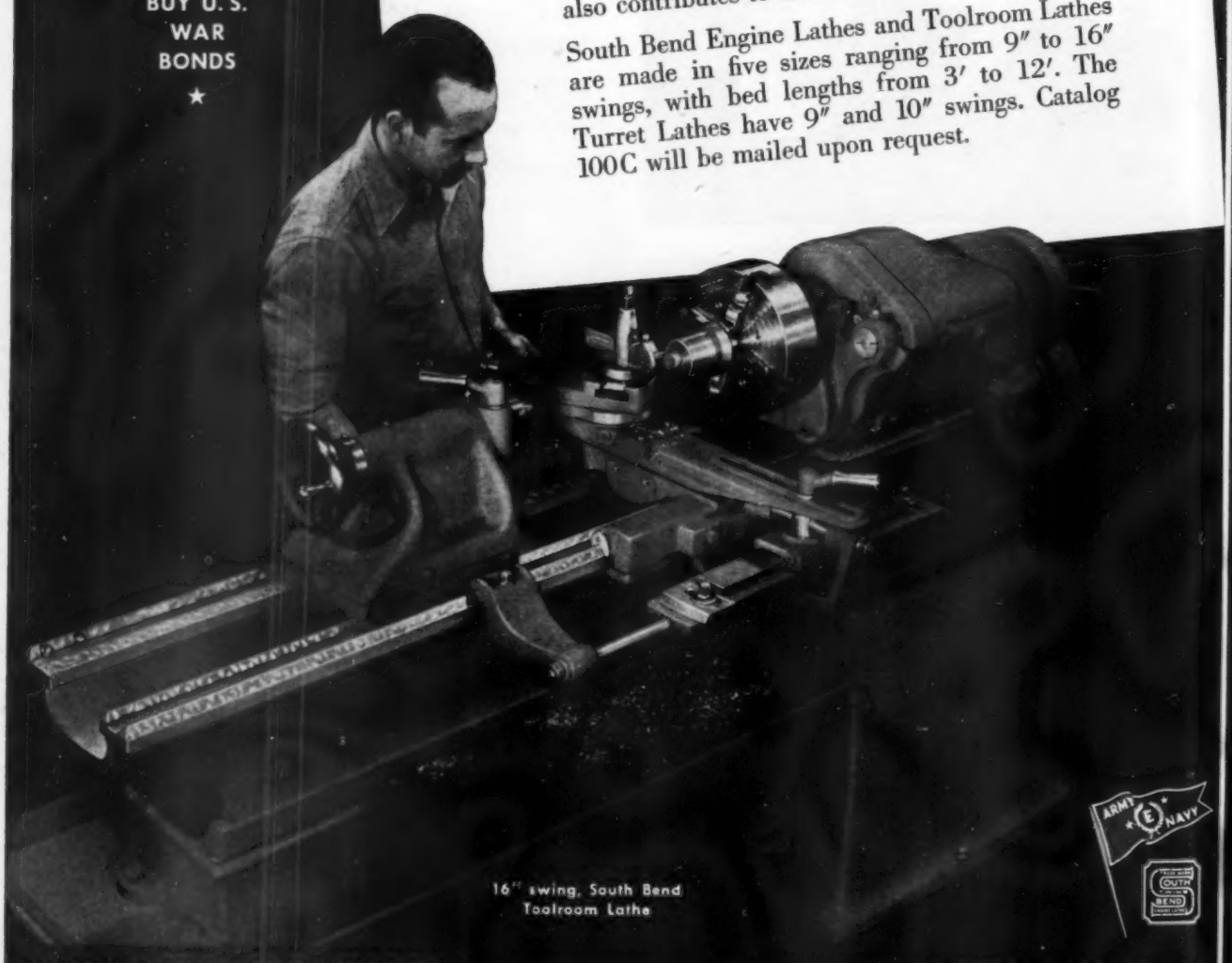
WITH SOUTH BEND LATHES

Time saved on production speeds the delivery of vital matériel to our fighting forces. Now, on the home front, it is a fight to the finish for maximum production.

South Bend Lathes can help you speed up production on toolroom and manufacturing operations. They have dependable precision, a wide range of speeds and feeds, and the strength and rigidity for effective use of tungsten carbide tools. Their ease of operation also contributes to their efficiency.

South Bend Engine Lathes and Toolroom Lathes are made in five sizes ranging from 9″ to 16″ swings, with bed lengths from 3′ to 12′. The Turret Lathes have 9″ and 10″ swings. Catalog 100C will be mailed upon request.

★ BUY U. S. WAR BONDS ★

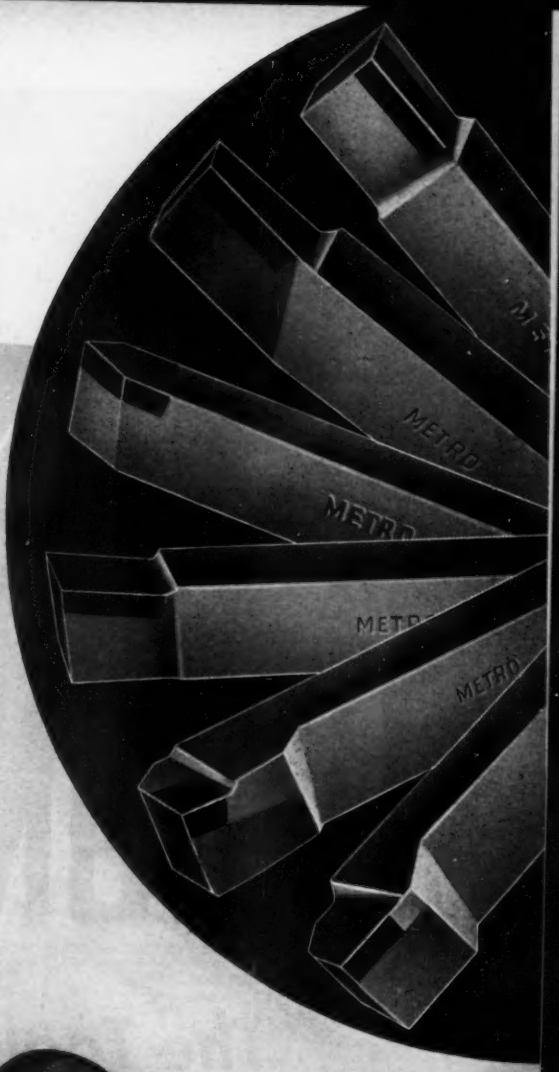


16″ swing, South Bend Toolroom Lathe

ARMY (E) NAVY

SOUTH BEND LATHE WORKS • *Lathe Builders for 37 Years* • South Bend, Indiana

..... OUT OF STOCK METRO STANDARD TOOLS AND GAGES ARE AVAILABLE FOR *Immediate* DELIVERY



RING GAGES

PLUG GAGES

SURFACE PLATES

THREAD GAGES

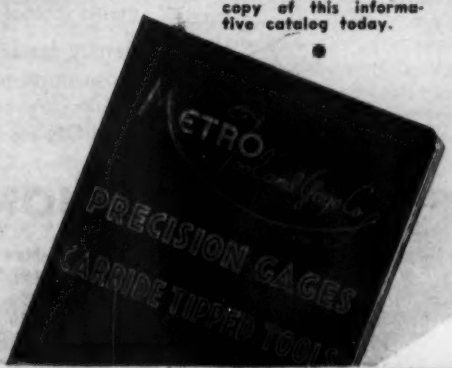
STANDARD TOOLS

AVAILABLE RIGHT OR LEFT HAND

Catalog No. 101

IMMEDIATE DELIVERY

METRO Standard Tools and Gages are available at once from stock. Catalog No. 101 features the complete line — write for your copy of this informative catalog today.



METRO TOOL AND GAGE CO.

4240 PETERSON AVE.

CHICAGO, 30, ILL.

UNION

"The Tools you Buy Again"

ARE THE TOOLS THAT ASSURE BETTER, FASTER WORK AT LOWER COST

Longer lasting accuracy and greater all-round efficiency of UNION tools under stepped-up production demands are the direct result of careful selection of materials, close production control through every step in manufacture and developments in tool design which only long, specialized experience can create.

Better, faster work at lower cost should be the determining factor in selecting those small tools which play such a big part in today's production. Because such results are consistently attained with UNION TOOLS, the wisdom of specifying "UNION" is apparent.

UNION TWIST DRILL CO., Athol, MASS.

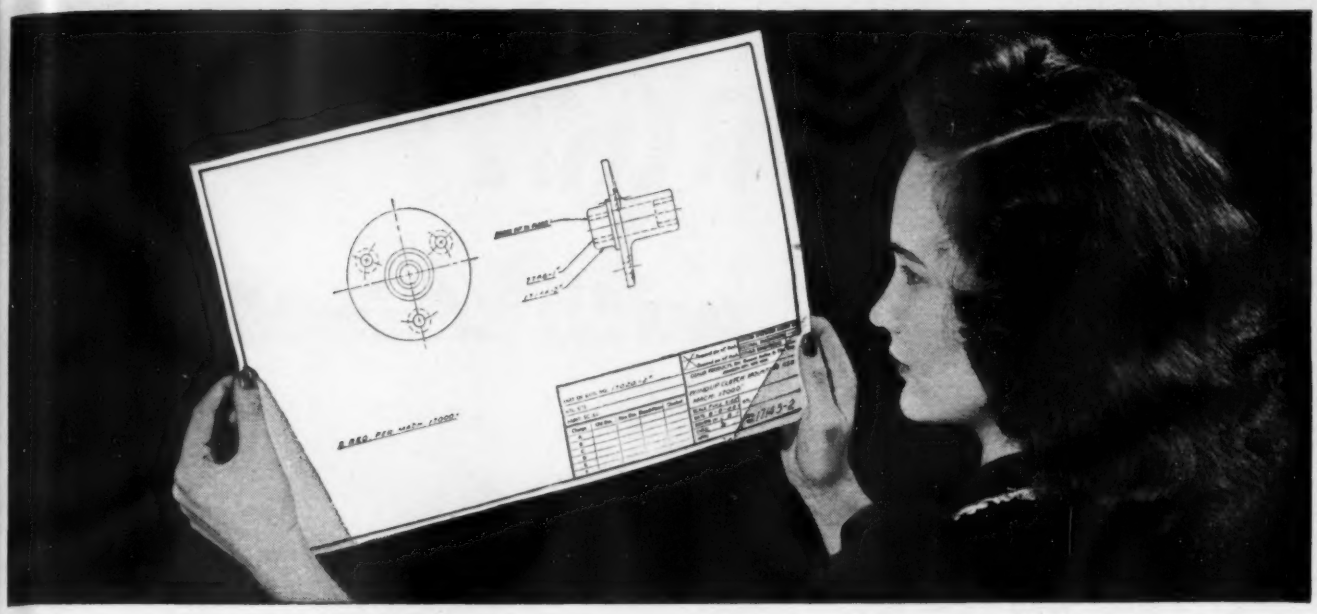
STORES—New York: 61 Reade St., Chicago: 11 So. Clinton St., Detroit: 6540 Antoine St., San Francisco: 121 Second St., Los Angeles: 524 E. Fourth St., Seattle: 568 First Ave., South.

MANUFACTURING DIVISIONS

S. W. Card Mfg. Co. Div., Mansfield, Mass.
Butterfield Div., Derby Line, Vt.
Butterfield Div., Rock Island, Quebec.

The UNION LINE
TWIST DRILLS
MILLING CUTTERS
REAMERS
HOBS
SLITTING SAWS
END MILLS
TAPS
DIES
SCREW PLATES
PROFILE CUTTERS

UNION



Look at this print from all sides

You'll probably agree that this Ozalid whiteprint is easier to read than a blueprint.

That's one feature—but now go behind the scenes. Look at Ozalid from all sides. Count the advantages it has over any other technical reproduction process.

1. PRODUCTION

Ozalid whiteprints are the easiest to produce. That's because chemical baths and driers are eliminated.

An Ozalid machine turns out positive reproductions of your engineering drawings, charts, letters, in one continuous operation which incorporates Exposure and Dry Development. All of Ozalid's standard and transparent materials are processed this way. What's more, you can use cut sheets as well as roll stock, thereby eliminating trimming waste.

Remember, too, an Ozalid machine is so clean and compact you can install it in your drafting room where anyone can operate it.

2. DRAFTING

You can save a thousand hours with Ozalid.

When you have to make design changes, it's never necessary to redraw any line which remains the same. It's this easy:

1. Make an Ozalid transparent copy of the original.
2. Delete the obsolete lines with a corrector fluid.
3. Draw in the new design.
4. Use this "new" original to produce subsequent prints.

Ozalid transparent materials may also be used to reclaim worn or soiled originals.

3. GENERAL USAGE

Ozalid whiteprints will have blue, black, or maroon lines on a white background depending upon your choice of paper. You can assign identifying colors to prints of different departments . . . distinguish checked from unchecked prints . . . establish a print control system which will lessen the possibility of loss or error.

4. YOUR SIDE

An Ozalid machine is bound to increase efficiency in your organization, save time, labor, and materials, and give you exclusive printmaking extras.

Some more Ozalid Users:

Massachusetts Institute of Technology
Pendleton Shipyards, Inc.
Goodyear Aircraft Corp.
Chance Vought Aircraft
Midwest Piping & Supply Co., Inc.
Bethlehem Steel Company
Ford Motor Company
Boeing Aircraft Company
Emerson Radio & Phonograph Corp.
Hazeltine Electronics Corp.

Get the whole story • Write for catalog and samples of Ozalid Whiteprints

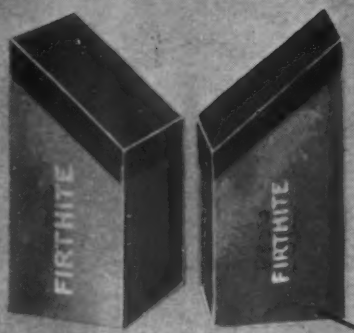
OZALID PRODUCTS DIVISION

GENERAL ANILINE & FILM CORPORATION

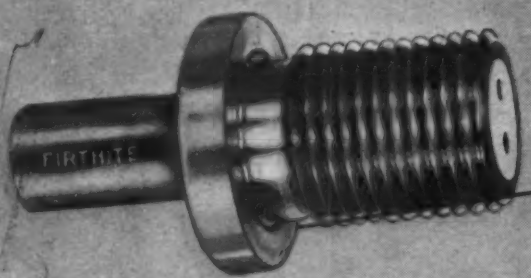
JOHNSON CITY, N. Y. ★ OZALID IN CANADA—HUGHES OWENS CO., LTD., MONTREAL

"WEARPROOF"

with Firthite ..



FIRTHITE-TIPPED
Screw Machine V-Rests



FIRTHITE-TIPPED
Thread Plug Gauges

FIRTHITE-TIPPED
Snap and Micrometer
Gauge Anvils

Extraordinary resistance to "wear and tear" (whether from abrasion, corrosion, or heat) is the outstanding quality of FIRTHITE Sintered Carbide. Its intense hardness, rigidity, and stability make it the BEST material for long life under extremely severe service conditions. A FIRTHITE insert will outlast hardened steel, chrome plating, nitriding, or hard facing—many times over. Insert FIRTHITE at the point of greatest wear!

FIRTHITE **Firth-Sterling**
STEEL COMPANY

Offices: McKEESPORT, PA. NEW YORK - HARTFORD - PHILADELPHIA - CLEVELAND - DAYTON - DETROIT - CHICAGO - LOS ANGELES

Makers of High-Speed Steels, Tool and Die Steels, and Sintered Carbides

... if your work, machines, or equipment involves ABRASION

FIRTHITE-TIPPED
Lathe and Grinder Centers

FIRTHITE-TIPPED
Burnishing Tools and Rolls

FIRTHITE-TIPPED
Plug and Ring Gauges

Please furnish this information when you request quotation on FIRTHITE wear-resistant parts:

Plus SCORES OF OTHER APPLICATIONS, SUCH AS:

Dial Gauge Indicator Points	Knurling Tools
Guide and Locating Pins	Scale Pivots and Parts
Cam Followers	Set Screw Tips
Feed Cams and Rolls	Spinning Tools
Lathe Work Rests	Straight Edges
Centerless Grinder Rests	Planishing Tools
Drill Jig Bushings	Broach Rings
Guides	Punches and Dies
	Etc., Etc., Etc.

IF YOU WANT to eliminate product rejections by maintaining accuracy . . . reduce maintenance of machines and equipment and thereby cut costs . . . minimize replacement of parts and thus save time and materials—**THEN SEND US** full particulars of your present equipment and process, including working drawings and samples of blank and part to be produced.

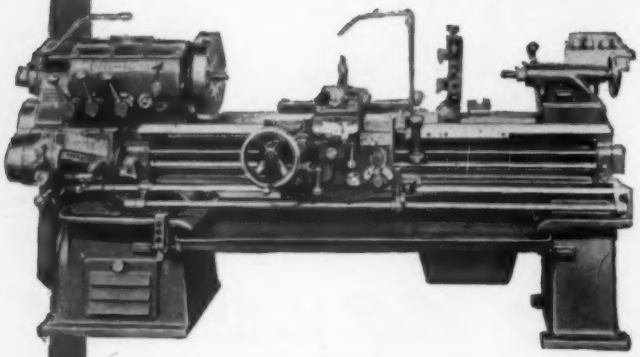
ARMY E NAVY

Firth-Sterling STEEL COMPANY

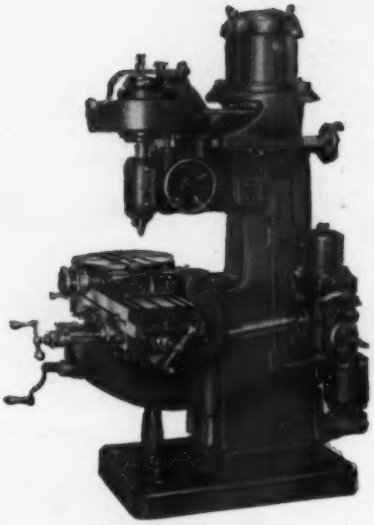
Offices: McKEESPORT, PA. NEW YORK - HARTFORD - PHILADELPHIA - CLEVELAND - DAYTON - DETROIT - CHICAGO - LOS ANGELES

Makers of Firthite Sintered-Carbide Tools and Tips, Punches and Dies

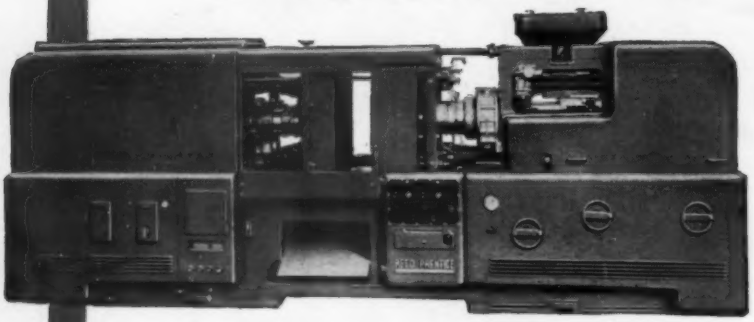
REED-PRENTICE PRECISION MACHINES



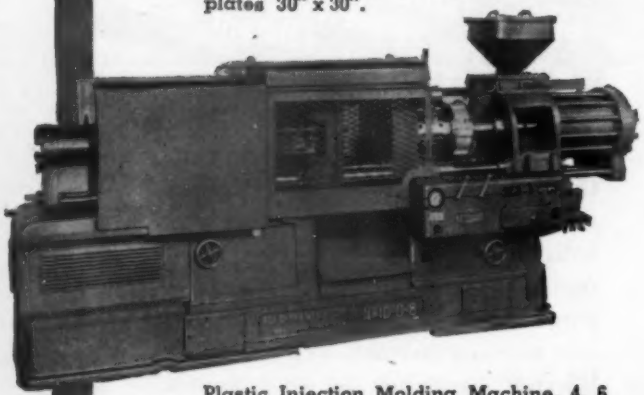
14", 16" and 20" Engine and Toolroom Lathes. Sliding gear head construction. Antifriction bearings throughout headstock, endworks, apron and quick change mechanism. Center distances from 30" up in increments of 24".



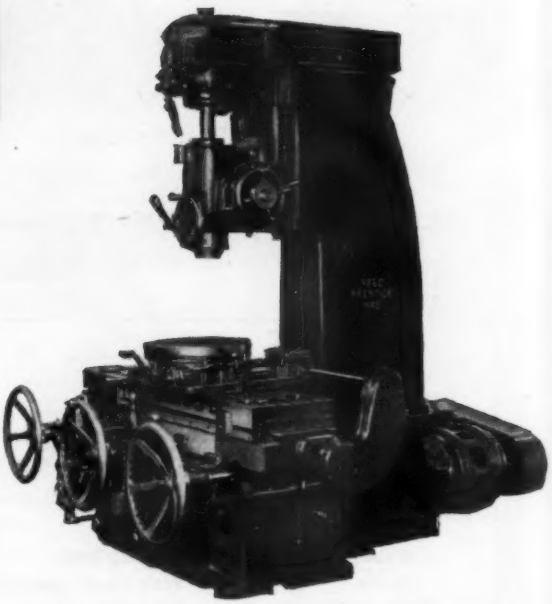
No. 3VG Miller, vertical type with back geared construction. Longitudinal feed 24". Cross feed 12". Vertical adjustment on knee 18". Table working surface 10¼" x 36". Weight 2850 lbs.



No. 10F-22 oz. Plastic Injection Molding Machine; featuring frame construction. Mold locking mechanism provides 600 tons clamping pressure and 16" movement independent of mold thickness. Die plates 30" x 30".



Plastic Injection Molding Machine, 4, 6 or 8 oz. capacity. Handles all thermoplastic powders. Adaptable for use with Saran, also thermosetting. Exceptionally rapid cycle, completely automatic. Newly improved.



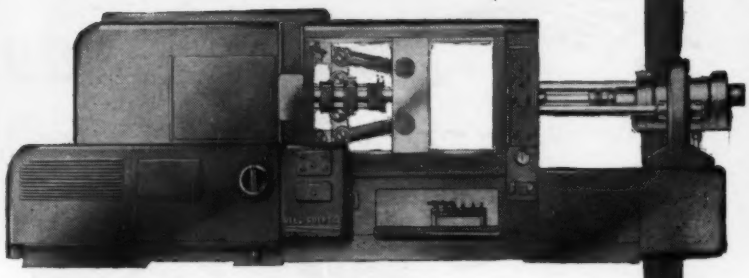
No. 5 Vertical Milling Machine. Heavy duty. Longitudinal feed 48". Cross feed 16". Spindle to table 30". Weight 11,500 lbs. Also supplied as Jig Borer with power down feed and measuring devices.

REED-PRENTICE CORP.
WORCESTER MACHINE TOOLS MASS. U.S.A.

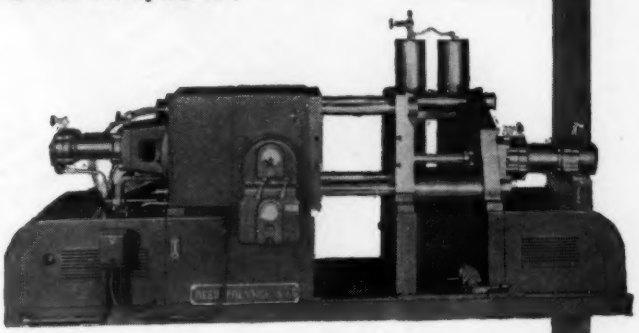
REED-PRENTICE PRECISION MACHINES

REED-PRENTICE presents for your consideration its line of machine tools as well as precision machinery for the die casting and plastic industries.

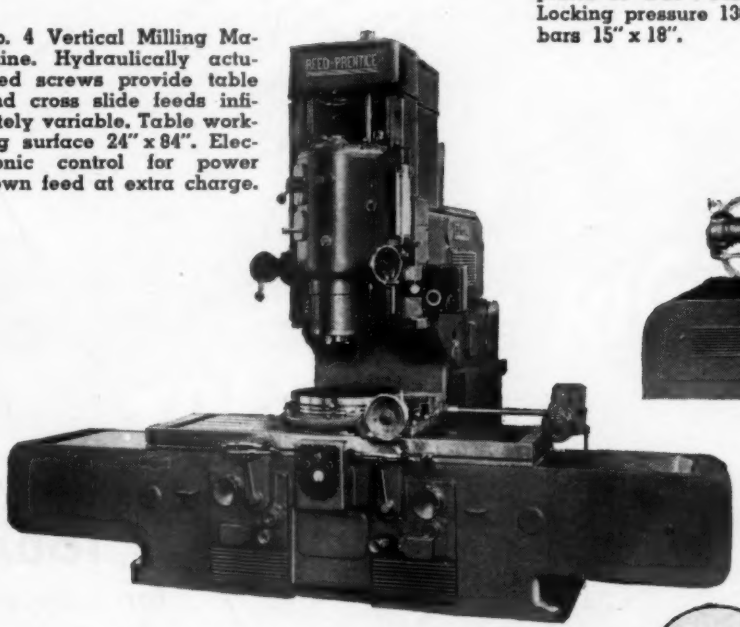
Constant development is being carried forward and we solicit your inquiries relative to the latest designs and improvements. Full information about all Reed-Prentice products will be gladly supplied upon request.



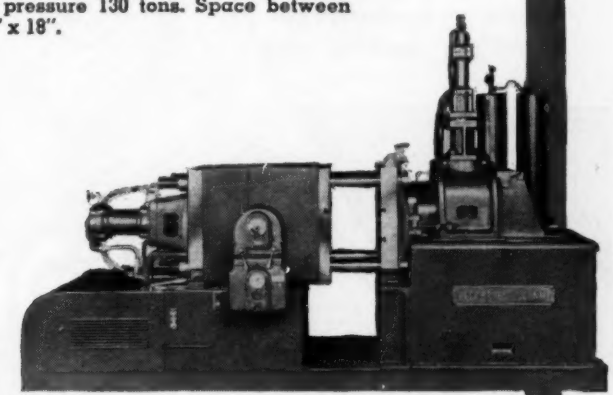
No. 3G Die Casting Machine for Aluminum, Magnesium, or Brass Alloys; featuring frame construction. Size of die plates 30" x 30". Maximum die thickness 24". Locking pressure 600 tons. Die opens 16".



No. 1½G Die Casting Machine, fully hydraulic, suitable for die casting brass, aluminum, magnesium or zinc. Size of die plates 28" x 29". Maximum die space 18". Locking pressure 130 tons. Space between bars 15" x 18".



No. 4 Vertical Milling Machine. Hydraulically actuated screws provide table and cross slide feeds infinitely variable. Table working surface 24" x 84". Electronic control for power down feed at extra charge.



No. 1½ Zinc Die Casting Machine. Fully hydraulic. Size of die plates 28" x 29". Maximum die space 18". Locking pressure 130 tons. Space between tie bars 15" x 18".

BRANCH OFFICES
1213 W. 3rd. St.
Cleveland. Ohio
75 West St.
New York City. N. Y.

REED-PRENTICE CORP.

MAIN OFFICE
WORCESTER
MASS. U. S. A.

"SCREWBALL" wonders what causes poor thread?

Here's a Check Chart listing 50 conditions that can cause poor threading

FREE on request

The makers of H & G DIE HEADS gladly send to Set Up Men and Supervisors of Automatic Screw Machines bulletins and papers on getting the maximum production per man, per machine, per day.

Die Headlines
H&G
VOL II
THE EASTERN MACHINE SCREW CORPORATION, 140 TRUMAN ST., NEW HAVEN, CONNECTICUT
No. 1
A GUIDE TO BETTER SCREW THREADS
Under war conditions, it becomes more and more important that we get the most we can out of the tools and materials that we work with.
Reducing the amount of scrap is the same as increasing the quantity of tools and materials available for war work.
If you are cutting screw threads, you will find the "Check" list shown below, a valuable guide towards better efficiency. If you are having any difficulties, find them in the following list and check the causes mentioned.
SO CALLED TAPER THREADS
Poor alignment.
Poor start.
Drag due to machine conditions.
Bad camming.
Chasers shave.*
Loose front plates or
Dirt under front plates.
Dirt in chaser slot of carriers, throwing chasers out of trackage or off on length, causing shaving condition.
Worn locking mechanism.
Best Die Head shanks.
Die Head needs overhauling.
Chasers or carriers sloppy fit in Die Head.
OFF LEAD
Chasers cut hard, due to improper chamfer relief.
Chasers are forced.
Chasers are held back by drag.
Chasers shave.*
ROUGH THREADS
Material cuts poorly.
Dull chasers.
Poor grinding.
Improper cutting fluid.
Too high speed.
POOR THREADS AT START
Poor grinding.
Hesitating start or
Poor camming.
Poor alignment.
Look thru past issues of "Die Headlines" where these subjects are dealt with. Write for any copies you may have missed and for any of the instruction books shown on the last page.
*To determine this, stop machine while cutting before die head opens and determine whether shaving. Remove keenness of frosted edges
THREADS DO NOT FIT GAGES
Threads off lead.
Threads taper.
Poor thread form.
Improper setting of the gage itself or worn gage.
POOR MACHINE CONDITIONS
Non-alignment.
Poor condition of spindle.
Cramping action.
Improper camming.
Too much float.
Improper speed.
Improper flow of cutting lubricant.
CHASER BREAKAGE
Chasers hit shoulder.
Worn chasers.
Dull chasers.
Improper grinding.
Back drag in machine.
Chip Shavings in Die Heads.
Chasers or carriers sloppy fit in Die Head.
Poor alignment.
Poor start.
Poor condition of threading spindle.
Improper cutting fluid.
Soft stock builds up false cutting edge.
Too small a die head for job.
Chasers not properly adjusted to size when starting.
Oversize stock, causing chasers to mill too much from O.D. or to start hard.
H&G
Insert Chaser
DIE HEADS

WRITE TODAY

for a copy of this Guide to Better Threading

THE EASTERN MACHINE SCREW CORPORATION

Manufacturers of H & G DIE HEADS • THREADED RODS • SCREW MACHINE PRODUCTS

21-41 BARCLAY STREET, NEW HAVEN, CONN.

MILLING CUTTERS last longer — produce more — when you "Treat 'Em Right". Correct cutter usage makes possible steady, high production rates, low cutter costs and, most important of all, savings in High Speed Steel.
Follow these simple suggestions:
1. Use the proper spindle speeds.
2. Maintain correct clearances.
3. Be sure shank of arbor or adapter is clean.
4. Use adequate arbor support.
5. Clamp work securely.
6. Mount cutter close to spindle.
7. Use sharp cutters.
8. Handle cutters carefully.
CUTTERS ARE WEAPONS—"Treat 'Em Right" and help increase the number available.
Tools ARE Weapons
TREAT 'EM RIGHT!
We are proud to be honored with the Navy "E", awarded for outstanding accomplishment in Defense production.
Brown & Sharpe Mfg. Co.
Providence, R. I., U. S. A.

BROWN & SHARPE CUTTERS

Then he said to himself

"VERY COMPLICATED, PLEASE"

Mild piece of understatement is that which Premier General Hideki Tojo made to his 83rd special session of the Japanese Diet:

*"The present war situation is very complicated. The enemy who was defeated at the beginning * * * is overcoming many difficulties and dangers."*

Of course, Tojo has read how *Recourse to Arc Welding* enabled us (his enemy) to fan out ships and planes and arms at spots which complicated his war situation.

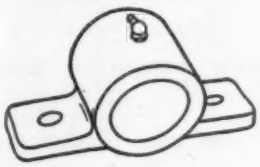
But perhaps he has not read of the mountains of little procedures, recourse to which overcame many difficulties and dangers for our production men.

"OVERCOMING DIFFICULTIES AND DANGERS"—he says

Look, Tojo: How having *Recourse to Arc Welding*, the production of war tools became *very simplified* for us . . . while their effect really made your position "VERY COMPLICATED."

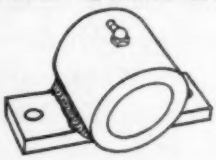
And think how in postwar they will make competition "Very Complicated" for a great many standpatters in production techniques.

VERY COMPLICATED, PLEASE



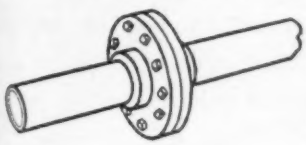
Drum shaft bearing . . .
Make pattern . . .
Mould . . .
Sand-blast . . .
(Cost in rough, $1.05)
Bore . . . Machine . . .
Drill holes.

VERY SIMPLIFIED, THANKS



Cut strap and drill holes . .
Saw piece of tubing . . .
Arc weld into unit. . . .
Total cost $0.50.

VERY COMPLICATED, PLEASE



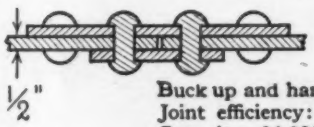
Connection in 10" steam pipe line . . .
Cut and thread ends of pipe . . .
Assemble with 2 flanges, gasket and set of bolts.
Joint requires maintenance.

VERY SIMPLIFIED, THANKS

Arc weld bevelled-end pipe . . .
A permanent, leak-proof joint.

VERY COMPLICATED, PLEASE

Structural joint requiring ½" plates . . .
Layout plates and straps accurately . . .
Drill holes accurately . . .
Put red-hot rivet in each hole . . .



Buck up and hammer down rivet heads . . .
Joint efficiency: 81.3%
Capacity: 24,390 lbs. per inch.

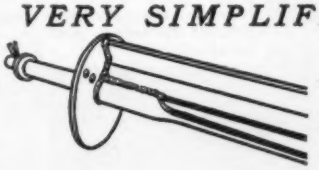
VERY SIMPLIFIED, THANKS

Only 7/16" plates required . . .
Bevel edge of plates . . .
Arc weld plates . . .
Joint efficiency: 100%
Capacity: 26,250 lbs. per inch.

VERY COMPLICATED, PLEASE

Axle for hay rake . . .
Make dies . . .
Forge parts . . .
Machine to fit . . .
Thread truss rod . . .
Assemble by bolting . . .
100% cost for loose-working assembly.

VERY SIMPLIFIED, THANKS



Cut angle, strap, bar and plate . . .
Arc weld into one unit . . .
70% cost for permanent assembly.

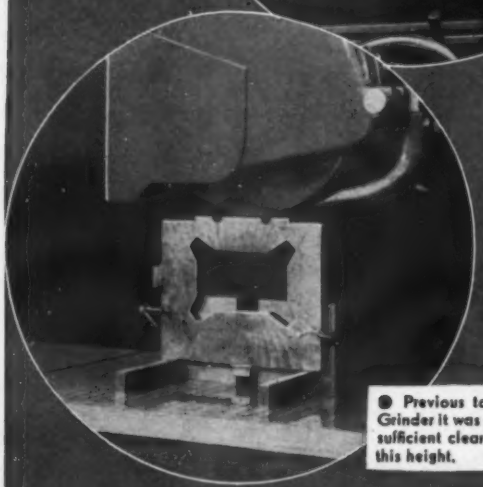
THE LINCOLN ELECTRIC COMPANY · CLEVELAND 1, OHIO

America's greatest natural **recourse**

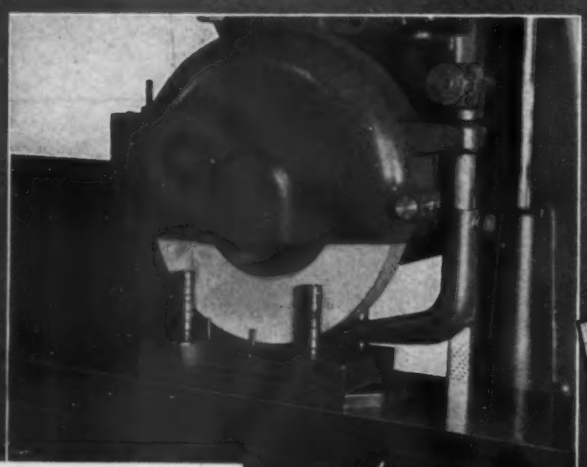
ARC WELDING

'TIME' OUT FOR DIE RECONDITIONING HELD TO A MINIMUM

● Material: Hardtem Steel Forging die.
Stock Removed: $\frac{1}{64}$'' from face side.
Present Time: 8 minutes.
Previous Time: 30 minutes.



● Previous to obtaining Mattison Grinder it was not possible to obtain sufficient clearance to grind dies of this height.

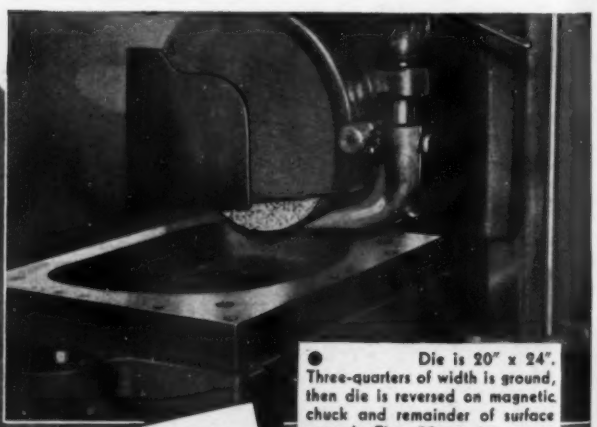


● Time is saved by grinding dies with leader pins in place.

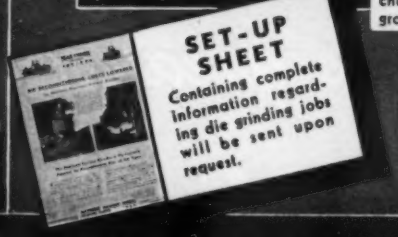
A GREAT variety of die work can be speedily and easily handled on the Mattison Surface Grinder. Its large capacity, ability to hog off stock and high power, keeps the 'time out' periods to a minimum.

A few examples of die jobs ground on the Mattison at a considerable saving in time, are shown on this page. Die shown in the lower left hand corner was ground with leader pins in place at ⅓ of former time. Wheel and spindle clearance of Mattison Grinder is sufficient to handle this type of work with ease, eliminating time required for disassembly and alignment when leader pins are removed.

For further data regarding use of Mattison Grinders for reconditiong dies, ask us to send you set-up sheets on this subject.



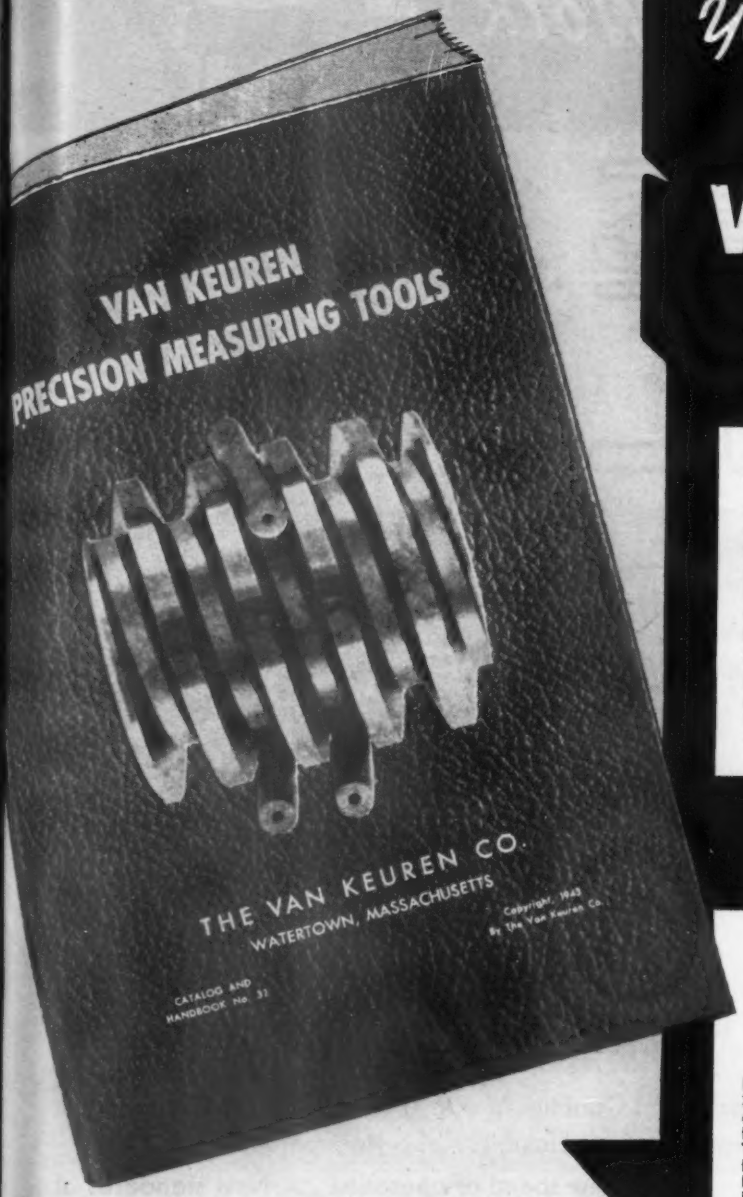
● Die is 20" x 24". Three-quarters of width is ground, then die is reversed on magnetic chuck and remainder of surface ground. Time 20 minutes.



SET-UP SHEET
Containing complete information regarding die grinding jobs will be sent upon request.

MATTISON MACHINE WORKS, ROCKFORD, ILL., U. S. A.

Just off the Press!



Your Personal Copy of the NEW VAN KEUREN HANDBOOK No. 32

This new 144 page Catalog and Handbook is a highly useful manual in convenient reference form on precision measuring. It describes and illustrates methods and equipment for checking accuracy to hundred thousandths and millionths of an inch. Use of the Van Keuren equipment described in this new booklet has resulted in many outstanding improvements in production and product quality and in vastly simplifying the problem of attaining closest tolerances on work of all kinds.

Partial List of Contents

NEW PRODUCTS

New Light Wave Equipment with fused quartz optical flats.
New solid square master blocks representing permanent accuracy.
New and complete gear measuring tables from 5 to 500 teeth.

ENGINEERING INFORMATION

How to measure standard and special screw threads.
Screw thread data including tables of basic diameters and tap drill sizes for all American threads.
Thread proportions for American and Foreign threads.
Bureau of Standards measuring wire specifications.
How to measure helical gears.
How to measure angles.
How to use optical flats.
Notes on gaging holes.

Mail Coupon TODAY!

THE Van Keuren CO., 176 WALTHAM ST., WATERTOWN, MASS.

th Year

timate

ccuracy

THE VAN KEUREN CO., 176 WALTHAM STREET, WATERTOWN, MASS.

Kindly send me a copy of your NEW Catalog No. 32. It is understood this request incurs no obligation on my part.

Name .....

Position .....

Company .....

Address .....

He Never Has to Take His Eyes Off the Cutter and Work

DEVLIEG JIGMIL

Spindle start, stop and reverse—

Power vertical feed and rapid traverse movement—

Power horizontal feed and rapid traverse movement—

Power automatic table retraction and repositioning—

Power feed and rapid traverse to bar movement—

are all carried in a master switch on the spindle head—at the operator's finger tips.

Thus, the operator of the DeVlieg Jigmil can fix his vision on the cutter and work—never has to look at controls during operation.

The Jigmil is what a machine tool should be—a powerful and accurate extension of the operator's hand. The value in precision boring and milling is apparent.

It's a NEW *Type Machine*

Spacing Accuracy of a Jig Borer . . . Performance Qualities of a Milling Machine . . . Convenience and Flexibility of a Horizontal Boring Mill.

New speed of operation . . . New standards of excellence of bored holes . . . New accuracy in milling . . . Automatic table retraction and repositioning dependable within .0002".

Many machines show 75% greater average daily productivity.

ARMY E NAVY

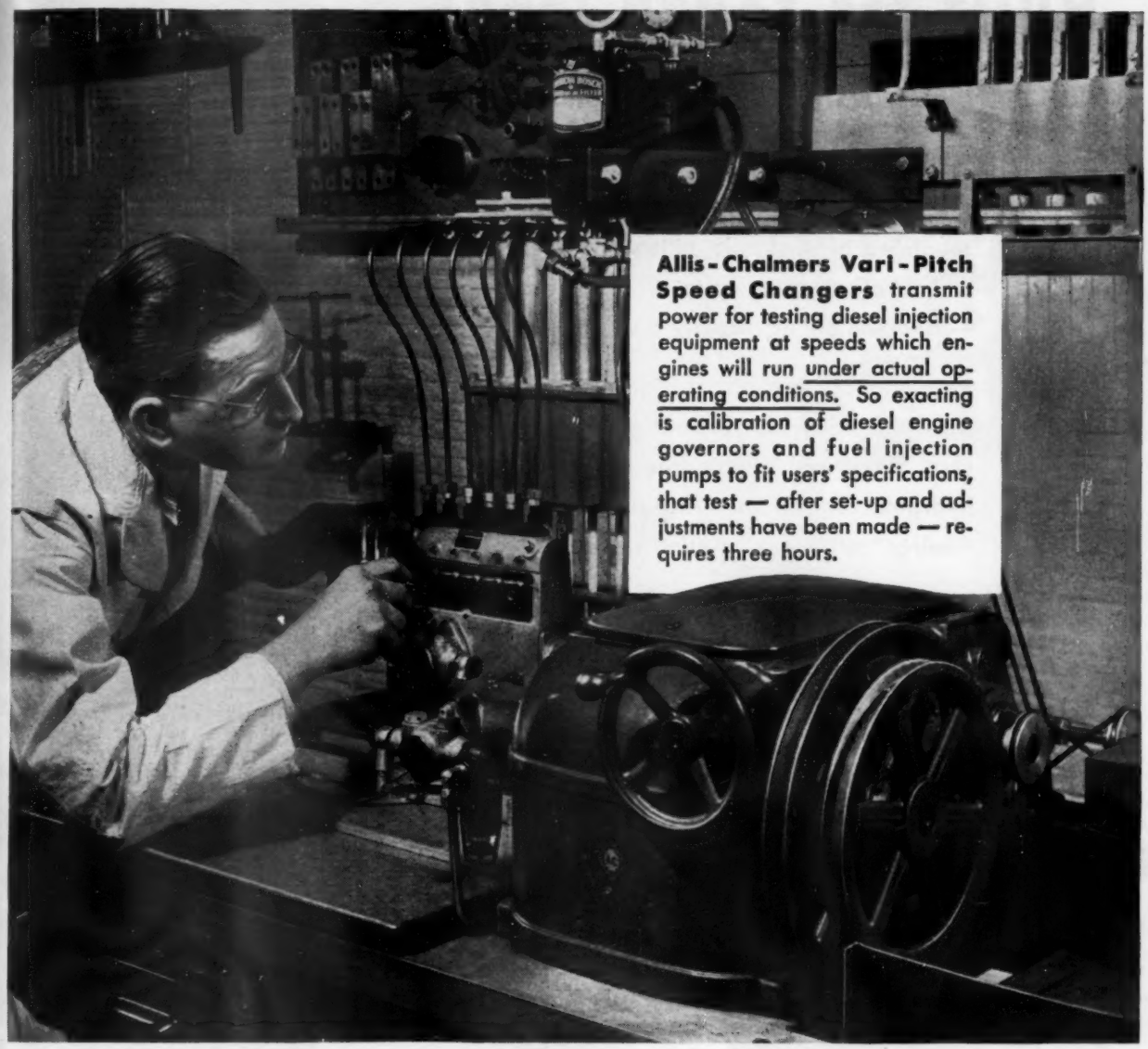
Write for Circular

DEVLIEG MACHINE TOOLS

DE VLIEG MACHINE COMPANY

450 FAIR AVENUE, FERNDALE (DETROIT), MICHIGAN

PRODUCT OF THE MONTH



Allis-Chalmers Vari-Pitch Speed Changers transmit power for testing diesel injection equipment at speeds which engines will run under actual operating conditions. So exacting is calibration of diesel engine governors and fuel injection pumps to fit users' specifications, that test — after set-up and adjustments have been made — requires three hours.

MILWAUKEE, WIS.—**Allis-Chalmers Vari-Pitch Speed Changers supply unwavering power to precision machines calibrating diesel engine governors and fuel injection pumps . . . where clearances of 39/1,000,000 of an inch can be measured only by oil leak-off, not by micrometer. Send for B6013.**

A 1704

WE WORK FOR VICTORY — WE PLAN FOR PEACE

ALLIS-CHALMERS · MILWAUKEE · WISCONSIN

MARVEL SAWS

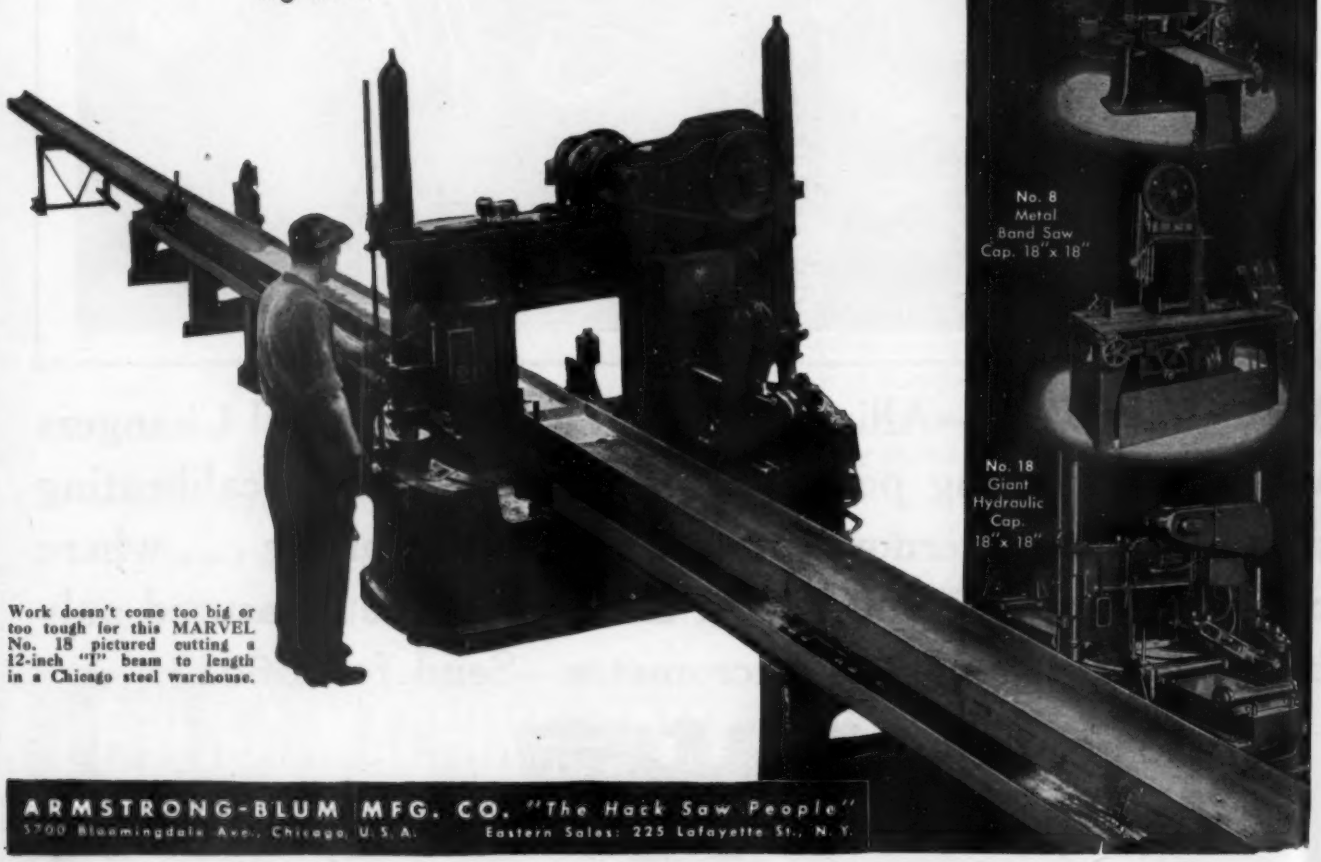
Built for tough jobs!

cuts off the largest sizes and toughest steels

The new MARVEL No. 18 Giant Hydraulic Hack Saw is not stopped by the size or toughness of steel bars, billets or pieces. It will cut off anything up to 18" x 18" square — and will cut off rapidly and accurately.

Revolutionary in cutting principle and design, this "Saw of Tomorrow" introduces: (1st) Simplified, trouble-free *low pressure* hydraulic control, and (2nd) a unique chip-freeing "roll stroke" cutting action.

Built to handle large and heavy work, it is armored to withstand the bumping and thumping around that is part of handling big work.



Work doesn't come too big or too tough for this MARVEL No. 18 pictured cutting a 12-inch "I" beam to length in a Chicago steel warehouse.

ARMSTRONG-BLUM MFG. CO. *"The Hack Saw People"*
5700 Bloomingdale Ave., Chicago, U. S. A. Eastern Sales: 225 Lafayette St., N. Y.

ARMY E NAVY

SUPER SERVICE RADIAL DRILLS

SPEED...ACCURACY...CONVENIENCE—ON TOUGH DRILLING JOBS!

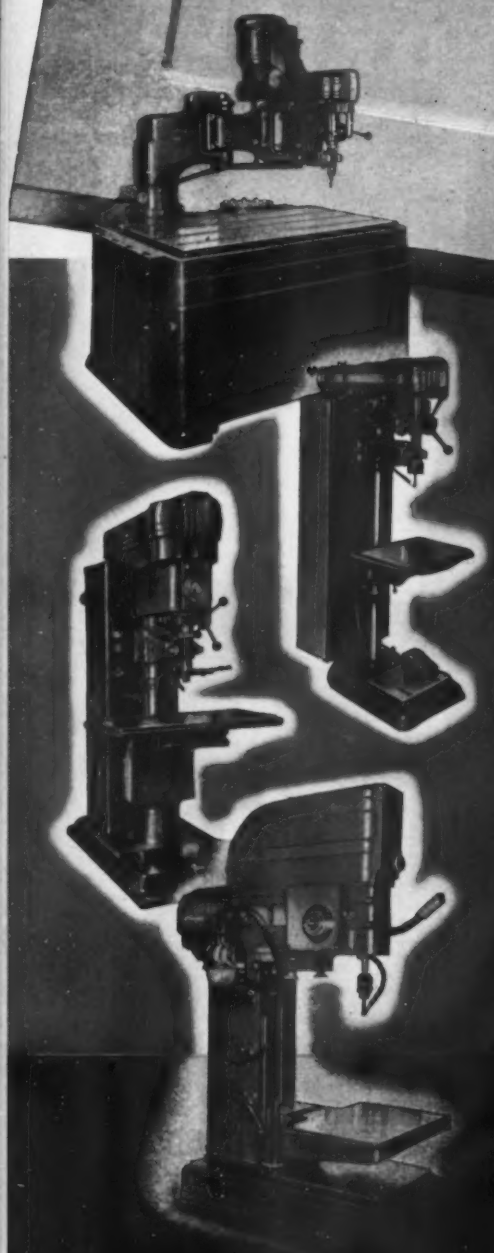
A "jumbo" job on a jumbo valve made of carbon molybdenum steel—and the Super Service Radial Drill does it with plentiful, smooth power and with the speed and accuracy made urgent by today's war needs. The machine is one of the battery of Super Service Radials in the plant of The Edward Valve and Manufacturing Co., Inc., of East Chicago, Ind. Work consists in drilling bolt holes on the bonnet flange of the body casting of a 14" valve for service at 1500 lb. pressure at 950°F. Note ruggedness of the machine—and low, convenient control levers that set a new standard for fast handling! Complete details sent upon request. The Cincinnati Bickford Tool Co., Oakley, Cincinnati 9, Ohio.

Important Announcement

TO THE METAL WORKING INDUSTRY:

New Revolutionary Tapping and Threading Machine to be Manufactured, Sold and Serviced by

Warner & Swasey



WARNER & SWASEY has acquired sole manufacturing and sales rights to the Bakewell Tapping and Threading Machine. The Bakewell Tapping and Threading Machine is one of the outstanding wartime developments in machine tools.

Precision parts for aviation engines and plane assemblies demanded extremely accurate threads (often up to class 5 gage in small holes). Critical materials—valuable time—were wasted because of a high percentage of rejections. Tap breakage was excessive—production was slowed down.

The Bakewell Tapping and Threading Machine was specifically designed to solve these serious problems. It introduced a new principle—a patented combination of a lead screw and solenoid actuated follower. It eliminates lead error, backlash, and compensates for wear of the lead screw against the follower.

This improved Tapping and Threading Machine is a logical addition to the Warner & Swasey line. Threading or tapping is often the last operation on a highly machined part which has been accurately turned on a Warner & Swasey. The inaccuracies can mean the scrapping of a costly part and the loss of all the previous operations which have gone before.

Send for catalog or ask the Warner & Swasey field man to explain the many features and advantages of this revolutionary Tapping and Threading Machine.

WARNER & SWASEY
TAPPING & THREADING
MACHINE FORMERLY

Bakewell

"Extreme Threading Accuracy on a Mass Production Scale"

4 Models: No. 0 0-80 to 8-32; No. 1 8-32 to 5/8;
No. 2 3/8 to 1-1/2; No. 1R 8-32 to 5/8.

Takes all Standard Taps, Class 3, 4 and 5 Gage Fits Threaded in One Pass.

WARNER & SWASEY
Turret Lathes
Cleveland

What's in This Issue

CHARLES M. PARKER

NE Steels in the Peace

The postwar United States need not defer to any other country either as to quality or production volume of alloy steels. Charles M. Parker, secretary, general technical committee, American Iron and Steel Institute, in an article on page 83, writes of the war-necessitated development of alloy steel production in this country, compares it statistically with the output of other countries, and evaluates the position it may be expected to assume in the peacetime world. This is the first of two articles by Mr. Parker; the second is scheduled for an early issue.

Saving Welding Rods

Using a semi-automatic bench fixture to make accurate butt welds of mild steel rods to fully coated electrodes, it is possible to effect considerable savings: not only is it no longer necessary to have the electrode manufacturer strip coating from ¾ to 1 in. of rod, but the ten percent of rod formerly wasted is now saved. The manner in which the rods are butt welded, and the fixture used, are described on page 87.

Fixtures up Heat-Treating

The number of pieces per charge of a pit furnace can be at least doubled by the use of properly designed fixtures. Furthermore, writes E. C. Prior, casting engineer, Hoskins Manufacturing Company, in an article awaiting you on page 90, by use of such fixtures it is possible to attain maximum utilization of the heating chamber consistent with adequate flow of gas, thereby improving the quality of the finished product. Mr. Prior details the principles underlying designing of fiixtures and illustrates typical ones.

Training Brings Strength

The Arma Corporation blended together the convalescence of disabled sailors with the training period for unskilled workers, and brought forth a plan to speed the transition of injured service men to a status of economic self-sufficiency. They recognized that service men lying idle in hospitals need activity for their morale, exercise to rehabilitate their injured parts and training to fit them for earning a living; all of these needs were met, with Navy cooperation, through operation of a plan described on page 97.

Practical Ideas

War Winning Suggestions and Ideas From Practical Men combine in a new department, "Practical Ideas." Page 99.

Aluminum Drawing Determinants

Tool design and material selection determine the satisfactory production of drawn aluminum shapes. The alloys that may be used and the simple rules to be observed in tool designing are detailed in "The 'Know-How' of Drawing Aluminum," a pictorial spread on pages 88 and 89.

Empire-Wide Interchangeability

War-front repair of damaged Lancaster four-motor bombers is speeded, through Empire-wide production to interchangeability standards established by the British Ministry of Aircraft Production. The manner of establishing and maintaining these standards in widely separate factories is the subject of the Armament Section. Page 105.

Lost Wax Gives Accuracy

A number of contractors are using the "lost wax" process, known for centuries by sculptors for casting finely detailed objects of art, and refined in modern times by dental laboratories to mold small pieces of high-strength materials. To apply this method to repetitive manufacture of precision cast parts, or to components of unmachineable materials, has required: 1. Development of a suitable mold material for metals melting at high temperatures; and, 2. Electrically controlled machines capable of making thousands of accurate wax patterns. In an article on page 94, W. E. Ruder, research laboratory, General Electric Company, describes that firm's accomplishments in these two directions.

Tool Blank Standard

Parts III and IV of the development of the American standard for circular and dovetailed forming tool blanks is traced and the present standard discussed and illustrated in the Reference Book Sheets, pages 121 and 123.

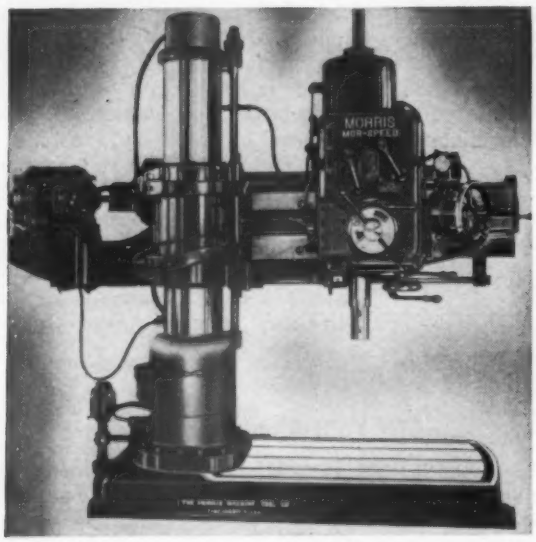
COMING

Three essentials to satisfactory hardening, brazing or soldering by the induction heating methods are: the machine, the induction coil and a suitably designed work fixture. Frank W. Curtis, consulting engineer of Induction Heating Corporation, described coil design in a previous number; in an early issue he will take up the application of tool-egineering principles to work fixtures. These range from extremely simple constructions to highly mechanized feeding units where small parts are produced in large quantities.

The amazing total of 800,000 machine tools has been produced for war purposes, the last three years. That is the equivalent of more than 20 years of normal production in peacetime. Some 700,000 of these machines have been installed in the United States metal-working industry. What to do with them after the war is a leading problem. Should they be offered to manufacturers in this country? How many should the government keep for future emergencies? Should some be sold abroad? Should vocational schools be permitted to acquire surplus machines at nominal prices? What kind of a price schedule in general should be set up? All of these questions, together with the scope of the problem, will be discussed in an article by Burnham Finney, to be published soon.

Engineered for the job

MORRIS *Special Multiple Drilling Machine*



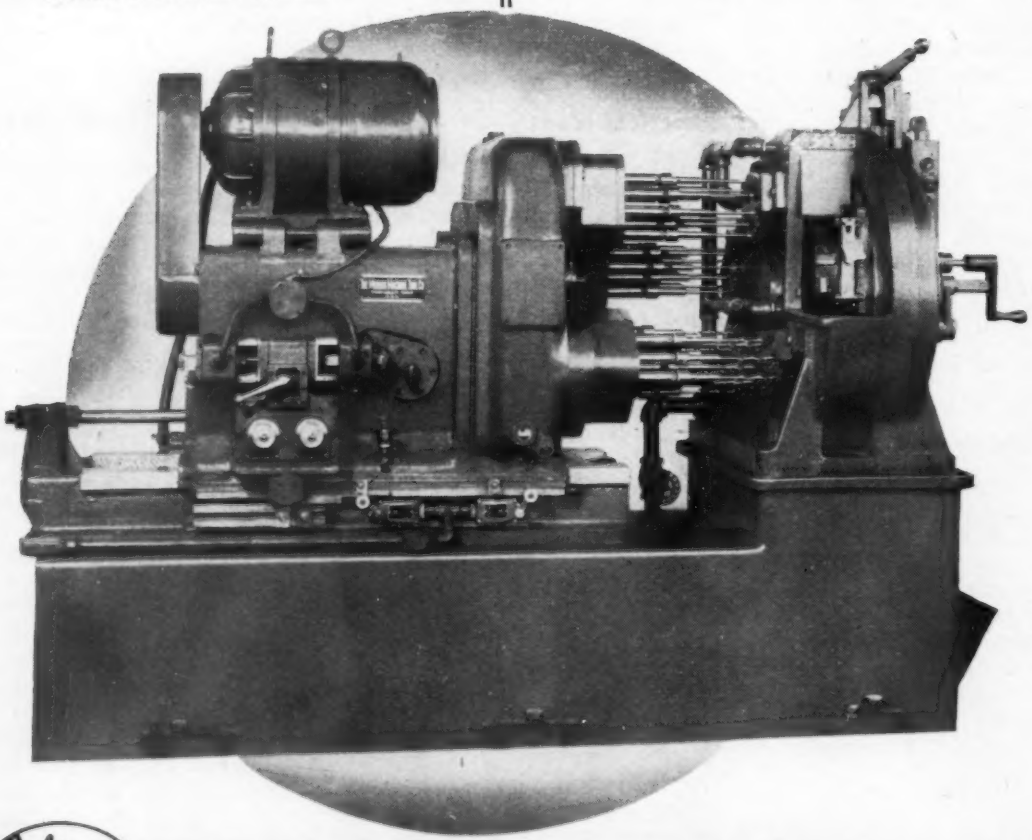
MORRIS MOR-SPEED RADIAL

• Many alert manufacturers are thinking today in terms of tomorrow's production. Plans are being formulated for new products, new processes and new methods of production.

Here's a typical example of a high production, single purpose machine designed to handle the drilling and reaming of bolt and pin holes in pump suction bodies—at a minimum cost per piece.

This machine has a 7½ H.P. hydraulic feed unit arranged for 32 spindles and electric controls for feed and reversing head motion. The 5 station indexing turret is provided with hand clamp fixtures so arranged that work may be loaded and unloaded while machine is in operation. Thus production is governed by the time of the longest operation.

If you are confronted with a production problem involving drilling, reaming, boring and tapping operations—or if you are contemplating a job requiring one or more similar operations consult Morris Engineers on equipment designed and built for your specific problem.



Builders of MOR-SPEED Radials

The MORRIS *Machine Tool Co.*

CINCINNATI, OHIO

American Machinist

ESTABLISHED 1877 • BURNHAM FINNEY, EDITOR

Use of NE Types of Alloy Steels To Continue After the War

BY CHARLES M. PARKER, SECRETARY, GENERAL TECHNICAL COMMITTEE, AMERICAN IRON AND STEEL INSTITUTE

Restrictions on high alloy steel resulted in the production of 4,900,000 tons of NE steel in 1943 out of a total alloy steel melt of 13,300,000 tons

No longer can we afford to be profligate in the use of steel alloying elements. Wartime experience with lower alloyed compositions has proved their long range value and economy

AS THE ARMIES of the United Nations move ever closer to the heartland of our Axis enemies, the triumphs of American metallurgy move with them. By now, it should be realized by all that the myth of European supremacy in steel technology and production has been dispelled—and you are among those who have helped to dispel it.

There have been many steels developed of importance to the war effort about which we may not now speak. In general, their value lies in some single physical or mechanical property which makes them suitable for a limited number of well defined specialty jobs, some of which have no peacetime counterpart. But there have been other steels developed which have been put to a wide variety of uses. Because the kinds of alloy constructional or engineering steels produced in war and peace vary little from each other in physical and mechanical char-

acteristics, with few exceptions, the lessons learned under either condition are carried over into the other.

Probably the major metallurgical development in tonnage steels which has come out of the war and which will remain to influence peacetime practices, has been the development of the National Emergency steels. Those steels were devised to make more effective use of the alloying elements at our command. The quantity of alloy steel which was required by our war effort was so great that we could not produce the conventional high-alloy steels of pre-war days and manufacture the quantity of weapons which the war program called for. There simply was not enough of the alloying elements within our reach to do that.

Alloying Elements Conserved

Not only did we have to conserve in the use of virgin alloying elements, but we had to make the maximum possible use of the alloying elements which were contained in steel scrap and we had to maintain the high quality standards set in easier times because, in most cases, redesign of material was not possible.

The importance of those steels to our war effort is probably best emphasized by a few figures on production. Production of alloy steel in 1943 reached an all-time high of 13,300,000 net tons. That amount of steel is greater than the entire steel production of Japan, which is estimated by some as high as 13,000,000 net tons, nearly equal to the total ingot capacity of the United Kingdom rated at 15,000,000 net tons, and more than half as great as the total pre-war ingot capacity of Germany, which was credited with 24,700,000 net tons.

Production of National Emergency steels during 1943 was approximately 37 percent of the alloy steel melt, or about 4,900,000 net tons. That quantity of steel is greater than the tonnage of alloy steel produced in the United States in any year prior to 1941. It is slightly more than 50 percent of the total pre-war capacity of the French steel industry, 10 percent greater than the Belgian industry and 60 percent greater than the Italian industry. It is equal to the combined total pre-war capacities of the steel industries of Poland, Sweden, Spain, Hungary and Rumania.

Prior to the war and for the first few months of our defense program, the trend was toward higher alloy content in engineering steels. As a result of the greatly expanded demand for alloys and alloy steels, both at home and for Lease-Lend, restrictions upon the use of alloying elements became necessary. Those restrictions not only reversed the trend to higher alloy contents but changed the pattern of alloy steel production markedly.

Production Status of NE Steels

The following analysis of production levels of constructional steels of the conventional heat-treating type (liquid quench and temper) by principal alloy groups will show in some measure what has happened since 1938. The figures given are based on the percentage which each group represented of total constructional alloy steel production. They do not represent absolute tonnage values since such analyses of data are at present subject to censorship, but they do show the inter-relationships of the several groups and the relative group sizes.

The straight nickel steels (2300 and 2500 series) rose 25 percent between 1938 and 1941. By the first quarter of 1943 they had declined to 34 percent of the 1938 figure, reflecting the restrictions originally placed on nickel in March 1941, the amendment of December 20, 1941, and the consequent use of alternate grades.

The straight chromium grades (5000, 5100 and 52100 series) rose 50 percent between 1938 and 1940, then dropped in 1941 to slightly below the 1938 level. By the first quarter of 1943, they had declined to 44 percent of the 1938 figure, reflecting the effect of the limitation order of December 20, 1941.

The nickel-chromium steels (3000, 3100, 3200 and 3300 series) exhibited a decline. In 1943, they reached only 30 percent of the 1938 tonnage due in part to the restrictions placed on nickel in March 1941. By the first quarter of 1943, they had fallen to 20 percent of the 1938 figure due to the order of December 1941, which limited the nickel and chromium contents of constructional steels to 0.60 percent each.

The chromium-molybdenum steels (4100 series) exhibited a continuous rise, increasing 275 percent between 1938 and 1941. By the first quarter of 1943, in spite of the restrictions placed on chromium and molybdenum, they were still 290 percent above 1938.

The nickel-molybdenum steels (4600 and 4800 series) also showed a rise, increasing 52 percent between 1938 and 1941. By the first quarter of 1943, they had dropped to 53 percent of the 1938 figure, once again reflecting the restrictions placed on nickel and molybdenum.

The nickel-chromium-molybdenum steels (4300 series) showed an increase of 37 percent between 1938 and 1941, due in part to this series being used as an alternate to the higher-alloyed 2300 and 2500 series. By the first quarter of 1943, they had risen to 855 percent of the 1938 figure, reflecting the introduction of the NE 8600, 8700, 8800, 8900 and 9400 series steels.

The straight molybdenum steels 4000 series) and the unclassified manganese-molybdenum steels declined 21 percent between 1938 and 1941. By the first quarter of 1943, they had fallen to 53 percent of the 1938 figure, due in part to the restrictions placed on molybdenum in the limitation order of December 1941.

The chromium-vanadium steels (6100 series) showed an increase of 106 percent between 1938 and 1941 but by the first quarter of 1943, they had fallen to 50 percent of the 1938 figure, reflecting the restrictions imposed on the use of vanadium.

At the present time and for the past two or three months, the alloy con-

TABLE I

Constructional Alloy Steels
Division by principal alloy groups

	1938-9	1940	1941	1943 1st Qtr.
Ni	5.6	6.0	7.0	1.9
Cr	14.2	21.0	14.0	6.2
Ni Cr	40.2	22.0	12.2	7.9
Cr Mo	7.6	9.8	28.3	22.0
Ni Mo	10.3	27.4	15.6	5.5
Ni Cr Mo	4.3	3.9	5.9	36.8
Mn Mo and Mo	7.2	4.0	5.7	3.8
Cr V	1.8	1.5	3.7	0.9
All other	8.8	4.4	7.6	15.0
Total	100.0	100.0	100.0	100.0
Production Index	100	197	325	488

structional steel melt has largely been composed of two classes of single-alloy steel (straight nickel and straight chromium), three classes of binary-alloy steel (nickel-chromium, chromium, chromium-molybdenum and nickel-molybdenum) and four grades of nickel-chromium-molybdenum steel. The quantity of alloying elements contained in scrap is now such that it is desirable to raise the tonnage of the triple-alloy steels in the 4300, 8600, 8700, and 9400 series to a larger proportion of the total melt.

Five NE Steels Are Most Popular

About a quarter of the alloy constructional steels cannot be changed over to one or another of the triple-alloy grades because they must possess special characteristics not inherent in any of the triple-alloy steels. One class of binary steels, the nickel-molybdenum group, is so economical of alloying elements contained in scrap that no change is necessary or desirable.

But another large group of steels, the characteristics of which are not different from the characteristics displayed by the NE steels, must be changed over to the triple-alloy group, not only to conserve the alloying elements in the scrap but to utilize the iron units and by permitting proper leeway in scrap economics, conserve other critical raw materials, conserve time in melting and reduce the load on already over-taxed transportation facilities.

The present production volume status of the triple-alloy steels shows the 9400 series leading the field, with the 8600, 4300 and 8700 series following in that order. Within those groups individual compositions have come to the fore. In the 9400 series 9440 leads by a very wide margin. In the 8600 series, the honors are about equally divided between 8620 and 8630. In the 4300 series, 4340 stands almost alone and in the 8700 series, 8720 comprises 100 percent of the tonnage. Briefly, we find a very high percentage of the total alloy constructional steel melt represented by two carburizing grades and by three semi-through hardening grades.

It is not surprising that such a condition should exist in steels which are put to use in the heat-treated condition. It is forceful support for the argument that when engineering steels are put into use, in a large majority of cases, the microstructure is more important than the chemical composition of the steel, provided sufficient alloy is present to make heat-treatment effective in depth.

From the foregoing and from the performance records of the National Emergency steels, it can fairly be stated that until the time that shortages forced it on us there was no set philosophy guiding the design of alloy steel compositions. It can also be fairly said that before the war we were wasteful in some of our uses of alloying elements. The leaner steels took over many of the jobs formerly done by the richer steels, and those jobs were done so well that, to the best of my knowledge, there no longer arises the question, "Are the NE steels strong enough or tough enough?" The principal question that now confronts the consuming industries is "Which of the grades presented shall be selected to solve the problem with the equipment with which individual plants have to work?"

Specifications Based on Composition

One of the chief reasons for our former wastefulness has been the widespread use of chemical composition ranges and limits in describing steels. This device resulted from early attempts to secure reproductibility of results. It was conceived in the days when steelmaking was a much less exact process than it is today, and it was fostered largely by interests outside the steel industry which sought to influence steel standards. Such influence had a direct effect on the economics of steelmaking and far-reaching effects, both political and technical, upon supply problems particularly as related to our war effort.

The rigidity of steel specifications which are written in terms of chemical composition has resulted in some peculiar situations. Time and again during the period of highest pressure for production, we have seen heats of alloy steel rejected because they melted a few points outside a nickel or chromium range rigidly set by a specification. Everyone concerned knew that the steel was of good quality and could have been used for the purpose intended, but the specification stood in the way. As a consequence, consumers of steel who were manufacturing finished goods sold on a performance basis could and did use those heats which had been rejected by those plants which were forced to work to rigid specifications, and many times a heat of steel was put to work in a job which was not deserving of the grade applied.

New Tests Balance Alloys

This circumstance resulted in delays and schedule dislocations on the one hand, and speed-ups and records broken on the other. In wartime no penalty accrued to the steelmaker, since demand for alloy steel far outran supply, but in normal times it would probably result in the scrapping of many heats of perfectly good steel.

Of course, the problem of evaluating a steel is always present, and up until the time that the standard end-quench hardenability test was devised, it was a rather difficult matter to secure adequate information relative to the characteristics of a given steel. Now there are methods of computing the standard end-quench curve from the chemical composition of steel and estimating from the calculated curve what the performance value of the steel will be in different size sections. Those methods are possible because the hardenability characteristics of constructional alloy steels as depicted by the end-quench test are related to the mechanical properties of steel in the quenched and tempered condition between the limits of 200 and 400 Brinell hardness. Without the standard end-quench test our National Emergency steel program could not have been put to use as rapidly and as successfully as it was.

And that test is going to come into

TABLE II

Index of percentage changes in the relationahips of alloy steel groups to total constructional alloy steel produced

	1938	1941	1943 1st Qtr.
Ni	100	125	34
Cr	100	98	44
Ni Cr	100	30	20
Cr Mo	100	375	290
Ni Mo	100	152	53
Ni Cr Mo	100	137	855
Mn Mo and Mo	100	79	53
Cr V	100	206	50
All other	100	86	170

even greater prominence in the future, not only because it is an excellent technical tool but because it is an economic tool as well. Properly used, it can assist us in avoiding the mistakes relative to alloy balance which we made in the past, because by its use it is possible to adjust steel composition in the furnace shortly before a heat is tapped and thus conserve alloying elements.

As an example of how the new methods of evaluation can be applied let us assume that a heat of steel is ordered to the following chemical composition ranges to be used in a 2½ in. round section:

Carbon, percent	0.33/0.38
Manganese, percent	0.60/0.90
Silicon, percent	0.20/0.35
Nickel, percent	0.40/0.60
Chromium, percent	0.40/0.60
Molybdenum, percent	0.08/0.15

The ideal critical diameters, that is, the diameters of bar which will just harden all the way through, based on No. 7 grain size are 2.16 in. for the minimums of the ranges and 5.16 in. for the maximums of the ranges.

When the heat is melted it is found to analyze as follows:

Carbon, percent	0.34
Manganese, percent	0.65
Silicon, percent	0.28
Nickel, percent	0.70
Chromium, percent	0.35
Molybdenum, percent	0.19

Clearly this heat will not qualify under the specification since it is 10 points high in nickel, 4 points high in molybdenum, and 5 points low in chromium. It is also to the low side of the ranges given for carbon and manganese. Because it is over the specified maximums for nickel and molybdenum, and therefore unacceptable, it would be a waste of time and materials to adjust the manganese and chromium upward.

If we calculate the ideal critical diameter, however, it is found to be 3.37 in. or well within the hardenability band set by the chemical ranges of the specification. Obviously the steel could be used for the purpose intended with proper heat-treatment procedure, and it is equally obvious that some manganese and some chromium could be saved. But rigid adherence to chemical specifications alone does not permit such savings.

Changes Needed in Describing Steels

In order to make maximum use of the new methods, however, we shall have to change present practices of describing alloy steels, and we shall have to think in terms of more complex alloys than we have heretofore—

Large quantities of alloying elements may not be available after the war, which points to a continuation of steels developed due to wartime restrictions

and in this there is what seems to be a paradox. Generally speaking, simple things are the most efficient and the most easily controlled, but in the manufacture of alloy steel simplicity can be wasteful. The National Emergency steels were devised on the basic principle that if two alloying elements are equally effective in producing hardenability, one-half percent of each will be better than one percent of either element alone.

That principle has been responsible for the conservation of thousands of tons of scarce nickel and chromium and the useful application of thousands of tons of less scarce molybdenum. It has also proved to be a useful tool in assisting us to devise new special service compositions such as copper-nickel steels, copper-molybdenum steels, manganese-nickel steels, silicon-nickel steels, and silicon-manganese-chomium-molybdenum steels. In addition, it has made it possible for us to make use of the small amounts of one or more residual alloy elements normally found in scrap and thus more closely control reproducibility of results.

In securing reproducibility of results by chemical composition or by keeping within a given hardenability range or band, our chief problems arise in controlling carbon, manganese and chromium, the oxidizable elements. But nickel and molybdenum have important effects on hardenability too. They do not oxidize and are relatively easy to control and adjust during the melting of a heat of steel.

Manganese and chromium are among those alloying elements which we do not possess in quantities adequate to maintain our steel industry and reserves of good quality are located far from our shores. Nickel and molybdenum are much less critical as regards location, as we shall see later.

Postwar Alloy Supply Will Be Low

After the war we shall have to make alloy steel from the raw materials which are most readily available to us. We shall have to utilize scrap from our own manufacturing operations, and scrap from discarded, obsolete, or partially destroyed industrial equipment and military materiel. Our trade relations with foreign countries may be influenced in marked degree by Article IV of the Atlantic Charter as we shall see later.

All those things point to the continuation in use of complex alloy steels, because the complex alloys save metal and because all residual elements are known, controlled and made use of. Large quantities of alloy elements may not be available to us from foreign sources and we should not draw too deeply on our own reserves. Moreover, the problem of scrap containing alloys will be with us for many years. Those points bring us right back to the original philosophy of the National Emergency steels—conservation without sacrifice of utility—and bring us face to face with new problems.

Part II of Mr. Parker's article on National Emergency steels will appear in an early number.

Tips Added to Coated Electrodes Reduce Welding Costs

SAVINGS IN PRODUCTION COSTS on welding jobs can be made by using fully coated rods butt welded to short lengths of plain mild-steel rods, thus enabling the welder to use all of the coated rod. This eliminates the practice of using coated electrodes from which 3/4 to 1 in. of flux has been removed for placing them in the holder, thereby making it necessary to leave 1½ to 2 in. of each rod as a stub. Electrodes cannot be burned much shorter for three reasons:

1. The welder cannot see through his electrode holder to watch the weld.
2. Welding with uncoated rod gives weld properties that do not meet required specifications for deposited weld metal, since some of the vital elements deposited in the weld are contained in the coating.
3. Electrode stubs weld fast to the electrode holders, making removal difficult.

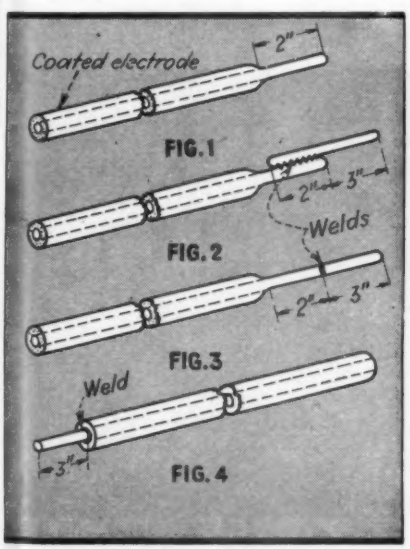
Study of the problem by one company producing light tanks proved the feasibility of using fully coated rods. Electrodes as originally furnished this company by welding rod manufacturers were stripped of flux at one end as shown in Fig. 1. It was found that 10 percent of this rod was wasted, because attempts to leave extremely short stub ends interfered with the welder's vision. Attaching plain mild-steel tips to the rods by spot or butt welding as shown in Figs. 2 and 3 overcame interference with the welder's vision, but savings proved to be small because there still remained 2 in. of uncoated original rod that could not be used. By test it was found that ordinary butt welding of a mild-steel tip to a fully coated rod as shown in Fig. 4 was not satisfactory because of the length involved and because of poor contact on the electrode close to the coating. But since butt welding to fully coated rod was desirable, additional tests were conducted until the welding sequence shown in Fig. 5 was developed.

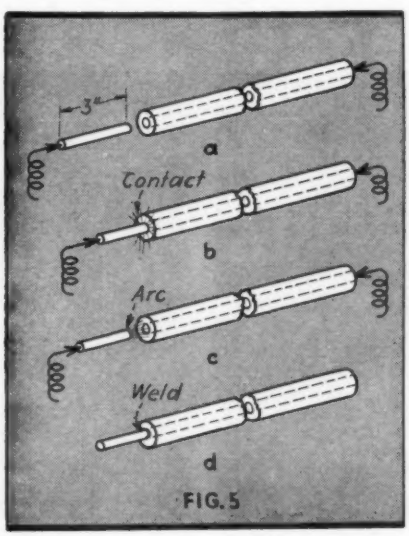
The method consists of holding a mild steel tip and fully coated electrode in a welding fixture with electric current applied at the far ends as in Fig. 5*a*. Operation of the fixture brings the two pieces together, as shown in Fig. 5*b*, and then immediately separates them about ¼ in., striking the arc illustrated in Fig. 5*c*. The arc is held momentarily, melting the end of both pieces. Then the pieces are again brought together and the current broken simultaneously, producing a clean strong weld as shown in Fig. 5*d*. A bench fixture semi-automatic in operation is used to make the butt welds. It consists of insulated V-blocks for locating the electrode and tip, a copper pad through which the current is conducted into the end of the coated rod, a sliding V-block that holds, locates and conducts current into the tip, a hand lever attached to the sliding V-block for bringing the tip into contact with the coated rod, and a foot-operated circuit breaker for controlling the welding current. A small pivoting flash shield carries two spring loaded fingers for holding the electrode and tip firmly in the V-blocks. Welding of these rods is done on a production basis by three workers. Two load and unload the welding fixture, while the third polishes both ends of the rods. The latter is done by taking a 2 in. bundle of rods, and pushing it through a hole in a wooden guard and up against a rotating sanding disk. Hourly production is 1,600 welded rods.

Estimated savings effected through the use of such rods has been based on building 10,000 light tanks, requiring 4,000,000 lb. of welding electrodes. These savings, calculated as shown in the table, is based on tests that proved 10 percent of the electrodes shown in Fig. 1 was wasted.

Savings Through Use Of Fully Coated Electrodes

Cost per tank of rods shown in Fig. 1: Size, in.	Weight, lb.	Cost per lb.	Total cost of rod
1/8	3	$0.62	$ 1.86
5/32	35	0.56	19.60
3/16	110	0.54	59.40
1/4	150	0.52	78.00
5/16	100	0.49	49.00
			$207.86
Savings per tank by eliminating 10 percent wasted stub ends			$20.79
Saving due to 10 percent reduction in time necessary to change electrodes, based on 1,800 rods per tank and 0.005 hours per rod change or nine hours per tank: 10% of nine hours at $1.25 per hour			1.13
Gross savings per tank			$21.92
Cost of butt welding tips to fully coated rods per tank, including cost of tips, cleaning coated rods, welding tip to rod, allocated fixture cost per tank, and salvage of stub ends from rods in Fig. 1			11.46
Net Savings per tank			$10.46
Savings for 10,000 tanks			$104,600.00





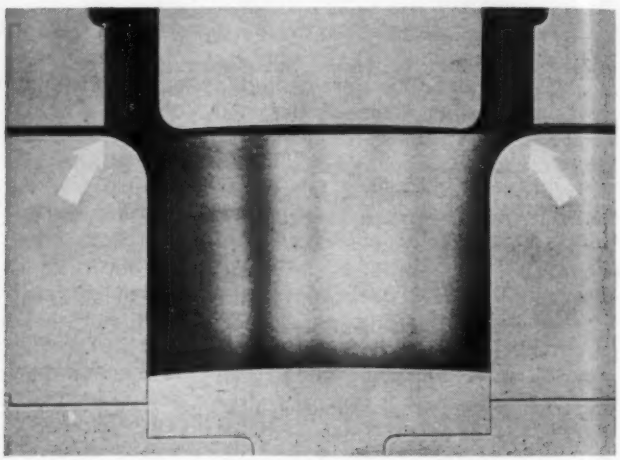
Mild steel tips butt welded to fully coated electrodes eliminate 10 percent waste caused by stripping flux from the rod for holder grip. Estimated savings in welding 10,000 light tanks is $104,600

The "Know-How" of Drawing Aluminum

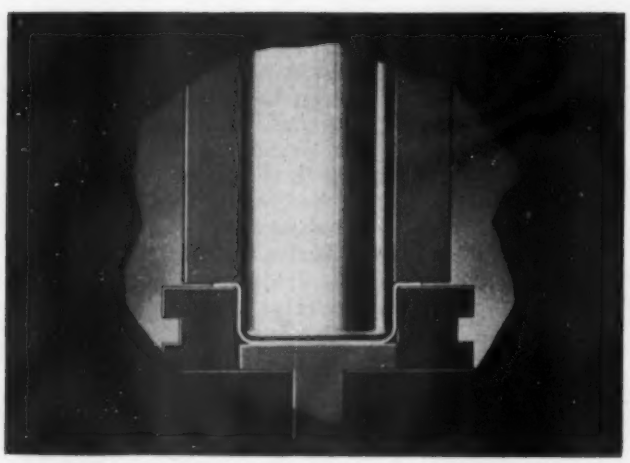
Satisfactory production of drawn aluminum shapes depends upon selecting material of the proper temper to withstand strain hardening, and observing certain simple rules in tool design. Five alloys are commonly used for drawn shapes—2S, 3S and 52S are hardened only by coldworking, but 24S and 61S are heat-treatable

Photographs selected from "Drawing, Stretching and Stamping of Aluminum," the new Alcoa how-to-do-it industrial movie.

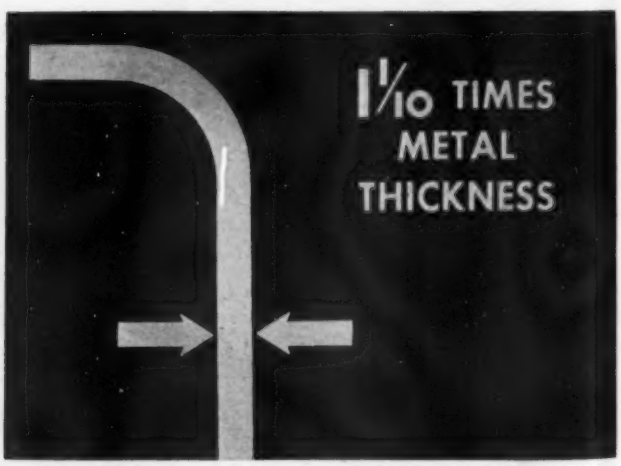
Drawing merely "plastically rearranges" the metal. The inch squares previously scribed in the blank have substantially the same area after drawing, proving that the metal has not been greatly stretched



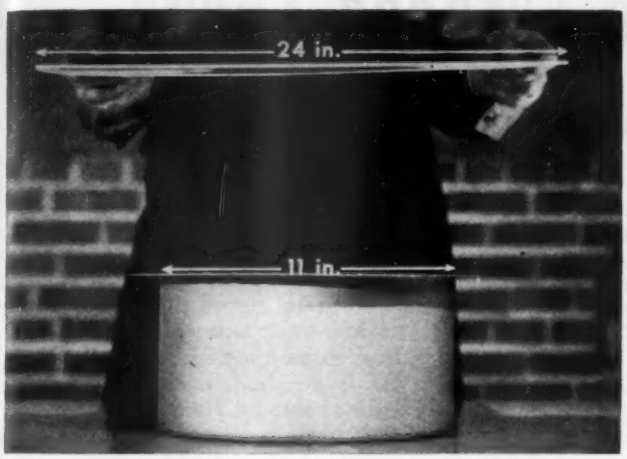
Die radius varies from 4 to 15 times the thickness of the blank, depending on the alloy and temper of the blank and type of draw. The radius on the punch should be about four times the metal thickness



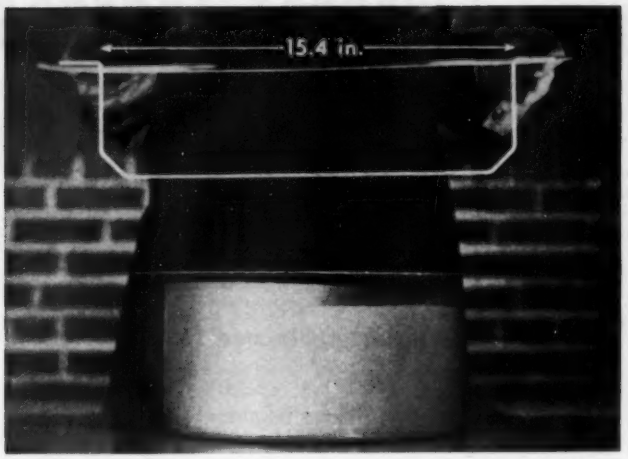
The blankholder clamps the blank only enough to let it slide smoothly over the edge of the die. Then the punch descends, drawing the blank into the die. The knockout pokes the shell out of the die



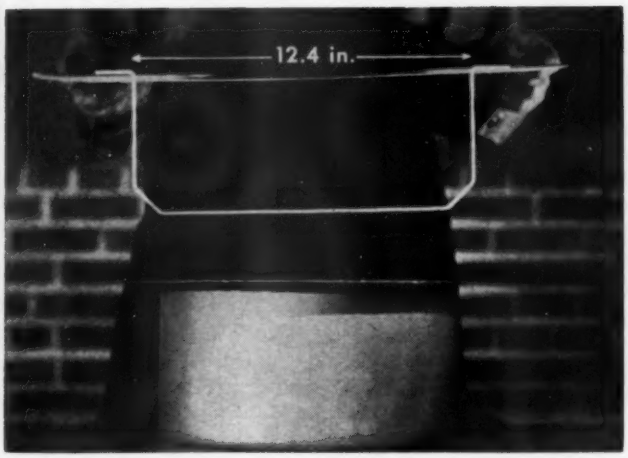
Clearance between punch and die should be one and one-tenth the thickness of the blank. It should be increased slightly in successive circular draws, remaining the same as the blank in final rectangular draws



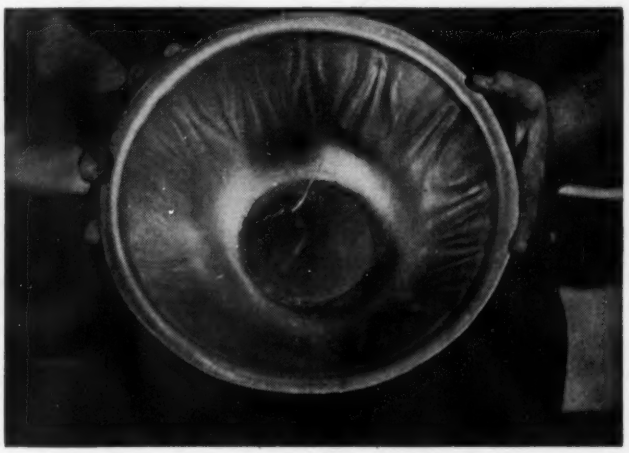
Many articles cannot be made in one draw. For example, a 24-in. blank of annealed 3S alloy cannot be drawn into a shell 11 in. in diameter in one draw, as that is more than a 50 percent reduction



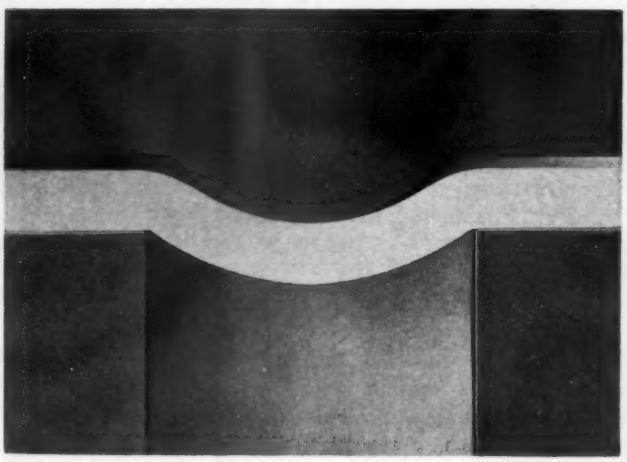
Thus, the first draw is made with a 40 percent reduction, producing a shell with a 15.4 in. diameter. Since the first draw has strain-hardened the metal, the second draw must be less than a 20 percent reduction



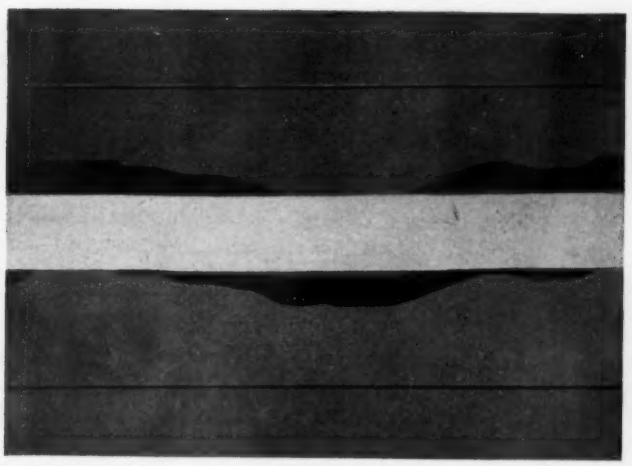
After the second draw, the diameter of the shell is 12.4 in. and the metal is even harder. The next draw should not reduce the diameter more than 15 percent, but calculations show that this will finish the job



Drawn hemispheres may require preliminary draws to prevent wrinkling. If such a shape is to be made in one draw, the ratio of the inside diameter to the original metal thickness should be kept below 200



The embossing punch is always made solid with the complete design, but the die may be one of two kinds. It may be open—at the point where the raised portion at the punch comes down



Or, it may be a closed die, with the design in the die an exact negative of the punch's positive. Closed dies are necessary for embossing elaborate designs but require more pressure to produce good results

Fixtures Increase Furnace Loads

BY E. C. PRIOR, CASTING ENGINEER, HOSKINS MANUFACTURING COMPANY

Pre-planning the charge for pit-type gas-carburizing and heat-treat furnaces often gives a several-fold gain in the number of pieces handled per heating cycle and improves quality of the product

WAR PLANTS have installed a considerable number of pit furnaces because this type fits their production requirements and manufacturing schedules. Generally speaking these furnaces are provided with a cylindrical work chamber. If the pit furnace is intended for carburizing, the gas atmosphere is often fan-circulated through the charge.

Efficient loading is an important aspect of using pit furnaces. Unskilled labor can be, and often is, employed to stack gears, shafts and many miscellaneous steel parts upon pallets or into a cylindrical basket, with no assurance that the work is spaced for maximum utilization of the heating chamber consistent with adequate flow of gas. Sometimes because of the awkward nature of the piece, or the bulkiness of the required tong, only two or three parts may be placed in the pit-furnace chamber. In consequence, many war plants have turned to specialists in heat-resistant alloys to design fixtures into which the work is loaded and the fixture is then lowered into the pit furnace.

Average experience indicates that the number of pieces per charge can be often doubled and more by the use of fixtures. There is a definite improvement in product quality, both in respect to deformation and soft spots. Over-all time cycles are shorter because of reduced loading and unloading time.

Fixtures for pit furnaces are produced in infinite variety, but there are certain features common to all of them. First, a fixture cannot constrain work pieces to retain certain specifications for alignment. The nickel-chromium alloy from which fixtures are made has a totally different coefficient of thermal expansion than steel. It is possible to position the workpiece for minimum deformation but that is all. Second, fixtures consist of assemblies of castings (often with certain bar stock additions) loosely fitting together to cope with expansion and contraction, and to avoid binding and warping. Third, components should be replaceable.

Nickel-chromium alloy is used in furnace fixtures to resist deterioration from repeated heating and cooling cycles, and because it loses strength less rapidly than other materials with increase in temperature. But the exigencies of any particular work-loading problem dictate the weight of the fixture. Sometimes the fixture weighs more than the load, sometimes one-quarter as much. The weight of the fixture and the heat consumed in heating it to process temperature are much less important than the primary objective—to increase the quantity of work processed per cycle of the furnace.

Any specialist in production of fixtures for heat-treating operations has his own design standards and in course of time develops certain constructions that he uses over and over in various ways. But it is not possible for the heat-treater to buy fixtures from the shelf. He should state his problem completely; the nature of the process, the size and weight of workpieces, critical areas of the parts, capacity of equipment and materials-handling arrangements in his shop.

Fixtures subject to thermal shock of quenching require the most attention to construction details that avoid undue warpage and short life. This is accomplished in a rack for heavy shafts, Fig. 1, by using three eyebars to connect the base casting and the upper guide casting. At the lower end, the eyebars have a Whitworth thread which is a loose fit in tapped holes in the base casting, and a tack weld prevents them from turning out. However if an eyebar is damaged, or the upper guide casting becomes inoperative for any reason, the bars can be removed and necessary new fixture elements installed.

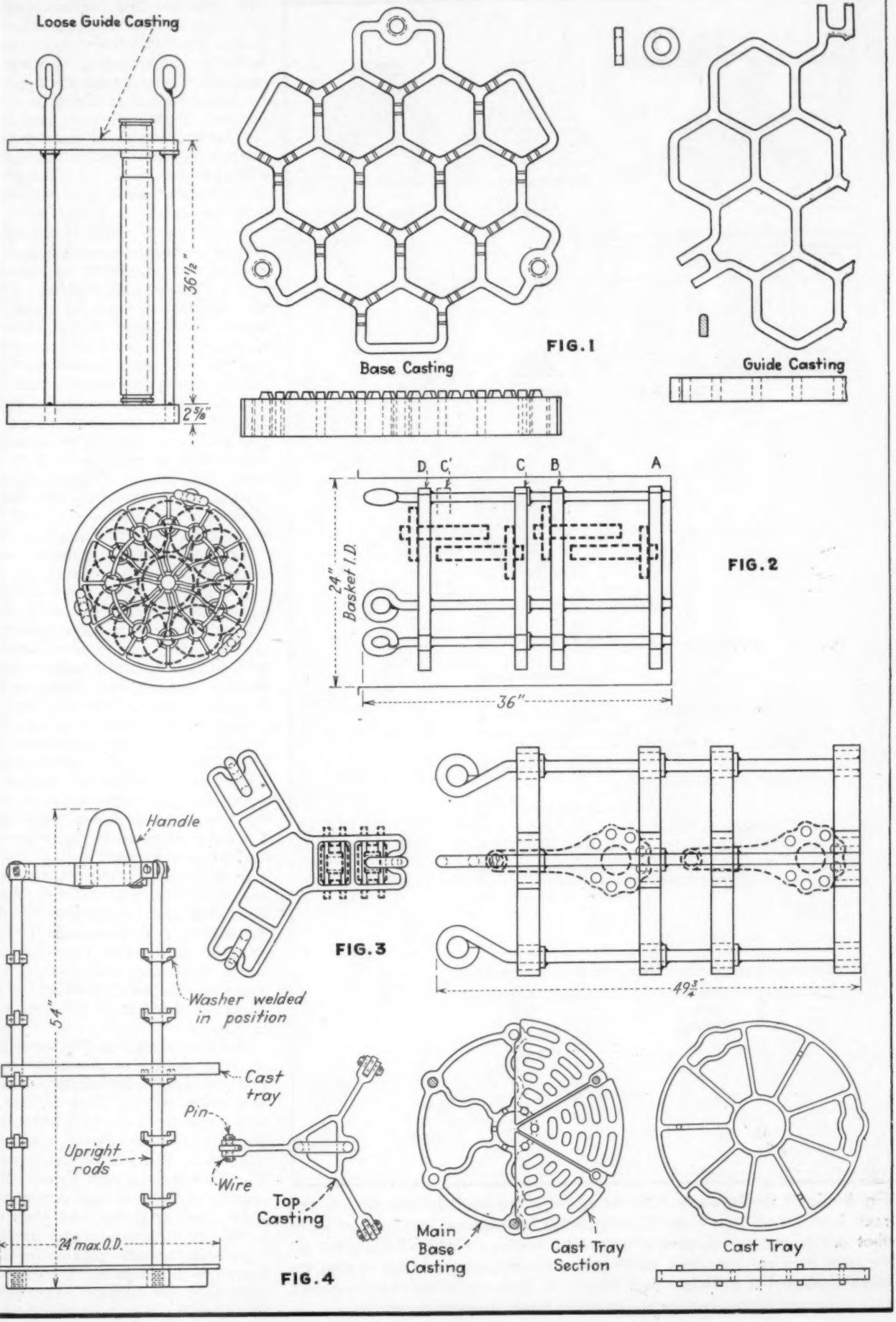
This rack weighs only 190 lb. but it carries twelve of the heavy shafts. Previous to its use, workmen could lower only two shafts into the furnace chamber with a bulky tong. The end of each shaft is located on the lower base casting by six conical lugs arranged in a pattern to enter a counterbore in the part. The upper guide casting weighs only 40 lb., is easily raised so that shafts can be inserted or removed without the use of a hoist.

Parts, such as a shaft with integral gear, are difficult to stack upon a pallet without the chance of toppling, and it is impossible to tier them with complete safety. The rack shown in Fig. 2 actually may be considered to quadruple the charge. There are four trays, *A, B, C* and *D* in duplex arrangement. Each tray has part-locating holes at 60-deg. intervals around a circle, and trays *B* and *D* also have a center hole. Thus the rack loads 26 pieces.

In both tiers, gear holes in the upper tray are displaced 30 deg. with the gear holes in the tray below. This arrangement allows close spacing of the parts. The method of loading is as follows. Six pieces with the gear end down are placed on tray *A*. Tray *C* is raised to *C'* to give room for loading seven pieces into tray *B*, shaft end down. Tray *C* is then lowered to its original position, gears are placed in it with the shaft end up, and finally *D* is loaded, shaft end down.

Another double-deck rack, Fig. 3, shows how a multiplicity of complicated heavy pieces can be placed in a

Fig. 1—A machine tool manufacturer can use this rack for increasing the number of spindle carriers loaded per cycle into a pit furnace. The rack takes twelve pieces, compared to two by tong loading. Fig. 2—Maximum utilization of space within the furnace chamber is achieved with this fixture. Trays B and D have work-locating points displaced 30 deg. from similar points in trays A and C, giving clearance for the gear shafts and doubling the load. Fig. 3—Twelve master rods for aircraft engines are securely held in this fixture, despite the weight and cumbersome nature of the part. Special cast trays can be made up in infinite variety. Fig. 4—Spacing washers welded to the uprights support grid castings. Pie-segment tray sections, suited to the work being processed, are then laid upon the cast grids. Features of this construction are easy repair of the fixture and side loading


Loose Guide Casting
36½"
2⅝"
Base Casting
FIG. 1
Guide Casting
D
C'
C
B
A
24" Basket I.D.
36"
FIG. 2
Handle
Washer welded in position
54"
Cast tray
Pin
Upright rods
Wire
Top Casting
24" max. O.D.
FIG. 3
49¾"
FIG. 4
Main Base Casting
Cast Tray Section
Cast Tray

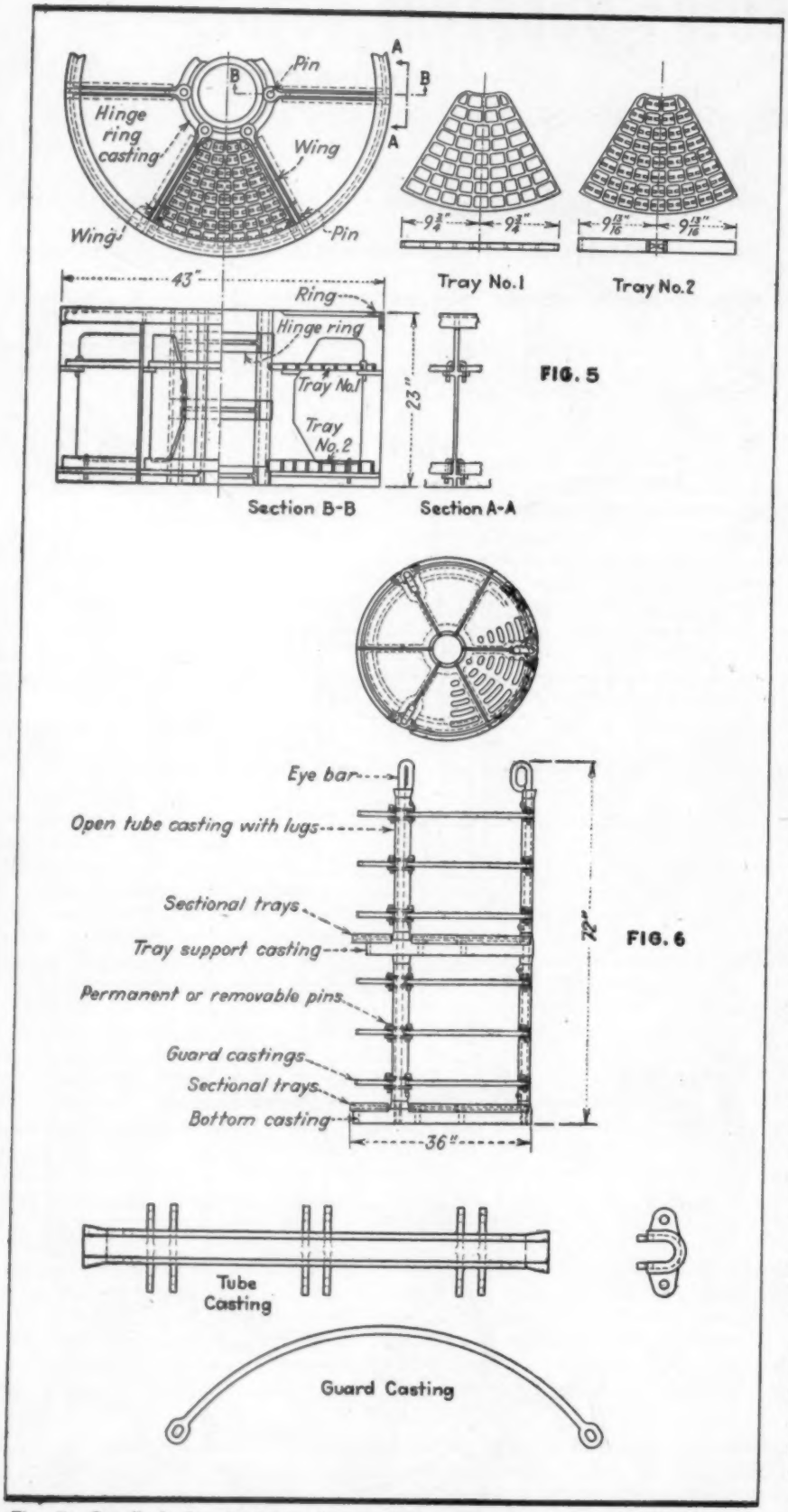


Fig. 5—Small shafts, 46 to each set of trays, are loaded vertically into this rack. Each set of trays 1 and 2 is supported by adjacent vertical cast wings that are pinned to the central hinge-ring casting. Fig. 6—Baskets for pit furnaces may use open-tube castings to support guard castings ringing the three eyebars. In a double deck fixture, as shown, a center tray is placed upon supporting castings positioned between the open-tube castings

rack, provided that the base castings and trays are specially designed. The four trays are cast three-legged spiders with two work-locating openings in each leg. These castings are supported by collars welded to the three eyebar uprights. Both upper trays have circular guide bushings at each locating position to receive the small end of the aircraft-engine master rod. The fixture accommodates twelve rods but weighs only 296 lb.

In the case of small parts that can be laid on trays, the multiple-deck arrangement is modified to that shown in Fig. 4. The base casting (into which the uprights are threaded) and five equally spaced grid castings provide six supporting surfaces for pie-segment cast trays. The tray segments have hole patterns best suited to the actual support of the workpieces and adequate flow of gas around them. Thus the grid castings are left in place on the fixture and the pie-segment trays are changed if several different kinds of parts must be processed. This fixture is thus an example of the flexibility that can be built into fixtures in addition to the principle of maximum work accommodation.

It will be apparent from this fixture and others illustrated that work loading and removal are not only simple, but "foolproof" in the sense that unskilled labor can hardly make mistakes. In the quenching rack shown in Fig. 5, definite spaces are provided for placing shafts vertically in specified "pockets." The rack consists of six cast wings pinned to a hollow hinge-ring casting at the center. Each wing has horizontal ribs that act as supporting ledges for upper and lower trays. The trays are placed on the ledges and held securely in place with U-shaped wire pins. Work support, but with minimum contact at the end of the shaft, is obtained by cast lugs protruding into the grid openings in the lower trays. Each set of trays holds 46 shafts, the entire rack takes 276, a high concentration considering that the device is only 43 in. in diameter by 23 in. high.

Obvious features of the above rack are: (1) quick knockdown for repair, (2) easy replacement of any part, (3) reversibility of the trays in case of warpage, and (4) ease of loading from the side. After the fixture is loaded a ring casting is placed on top to act as a support for the next fixture. It is possible to fasten a base casting to a center post, or eyebar, and place one or more of these fixtures over the post.

Built-up baskets provide another means of heat-treating a variety of parts in a pit furnace. The design shown in Fig. 6 may use only the base

casting for supporting sectional trays, and in this case the entire height of the basket is available as a cylindrical container. Or a tray support casting may be used midway up the eyebars to effect a double-deck arrangement. Then, if necessary for loading the baskets, segmental guard castings can be swung outward by removing the pin at one end.

This fixture is another example of how the designer attempts to use constructions which are easily set up or dismantled. Three eyebars are screwed into the base casting. Shorter U-tube castings fitting around the eyebars are held in place by pins. The U-tubes contain lugs for the pins holding the guard castings in place. Thus, the fixture can be torn down by removing pins, an important feature of an assembly subjected to repeated heating and cooling cycles.

In another type of basket, Fig. 7, ease of replacement is again a feature although the construction differs. Four flat uprights are pinned to a base casting and likewise to the top casting, which is a four-legged spider fitted with a lifting handle. Tray support lugs are cast integral with the side bars. In each group of trays, the lower one is fitted with a wire mesh bottom to support small shafts, while the upper tray has a grid with holes of proper size to act as guides for workpieces. Spacing between each set of trays is sufficient for hand room to load from the side of the fixture without dismantling it.

Another design of basket, Fig. 8, for pit-type carburizing furnaces may be stacked two or more high. Toppling or misplacement is prevented by self-locking hooks and lugs cast on the upper and lower surfaces of each basket. Two or three baskets can thus be tiered and transported to the furnace by hoist.

Each basket has an open bottom into which a removable grid casting is placed. The grid is made in two halves to permit easy entrance. These grids can be supplied with round, square, rectangular or hexagon holes to reduce their weight and provide passage for carburizing gas. Lugs can be provided on the surface of the grids to reduce work contact. And if the part to be heated is taller than any one basket, the grids can be removed from a sufficient number of baskets to give the required height.

These examples of fixtures for pit furnaces indicate the numerous possibilities available to the metal-working industry, both in respect to proper handling of a specific part and adaptability of several types to a number of different pieces that the heat-treater must process in the same equipment.

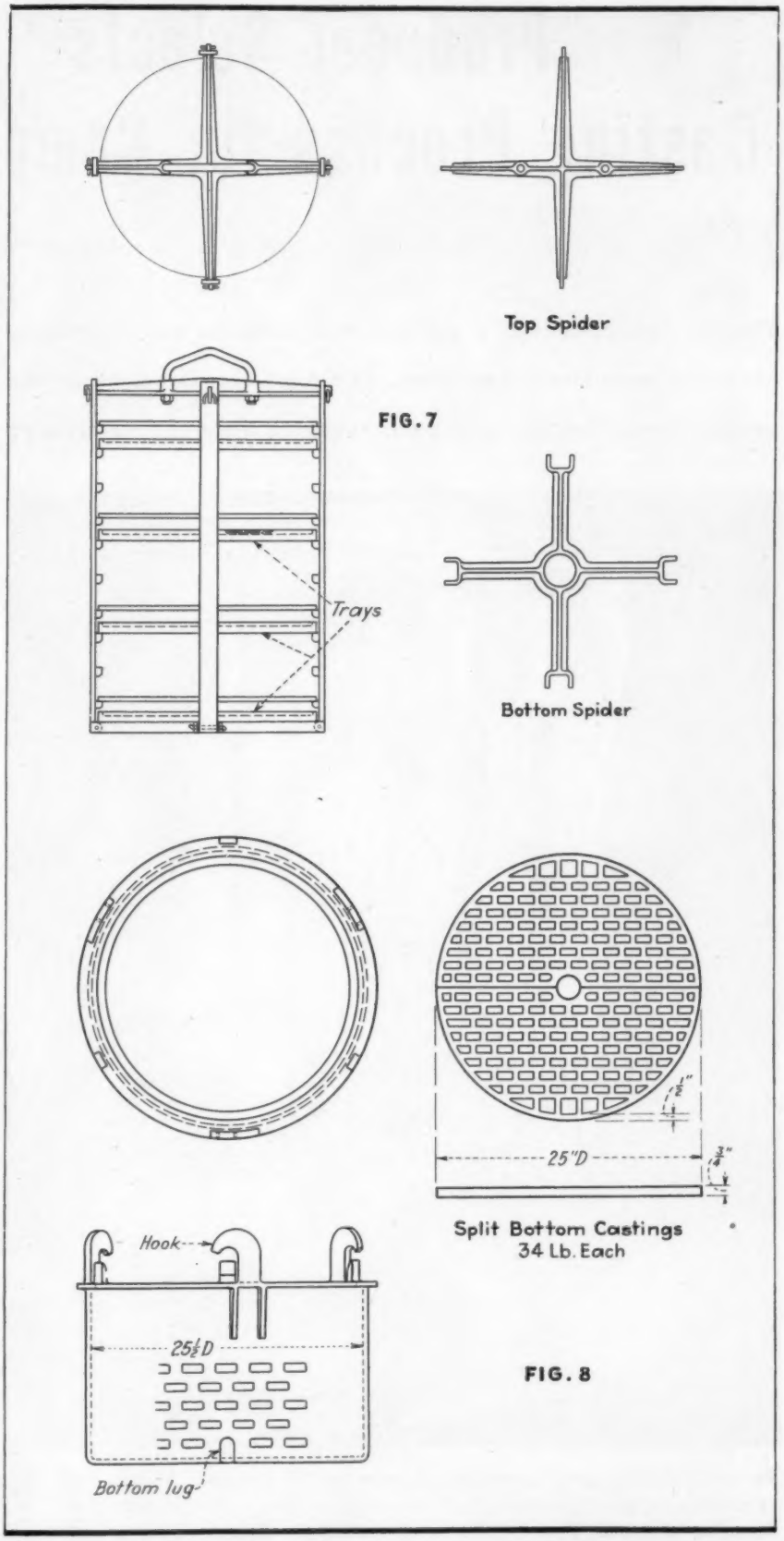
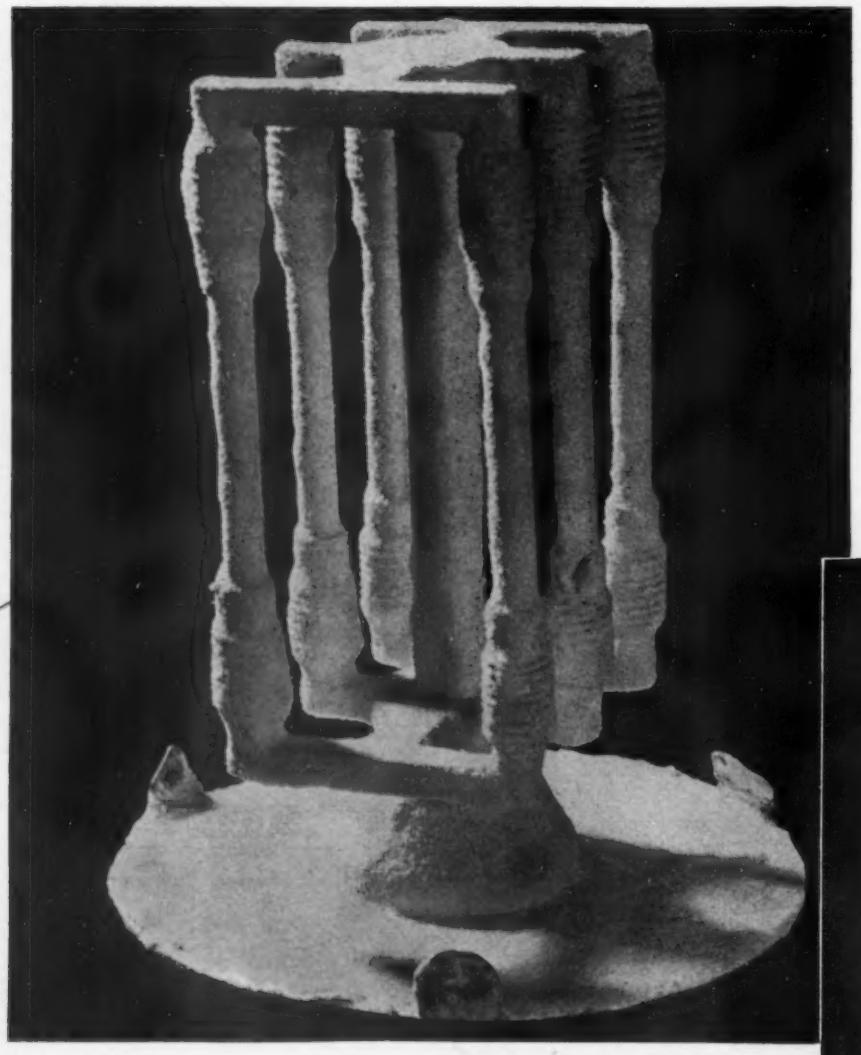


Fig. 7—Another variation in basket construction employs lugs cast integrally with the side bars to support trays. The assembly can be dismantled rapidly by removing the locking pins. Fig. 8—Carburizing baskets for pit-type furnaces can be of completely cast construction and made self-locking when tiered. The false bottom grid is split for easy insertion in the basket, and the openings in it allow proper flow of carburizing gas

War Producer Selects "Lost Wax" Casting Process for Complicated Parts

BY W. E. RUDER, RESEARCH LABORATORY, GENERAL ELECTRIC COMPANY

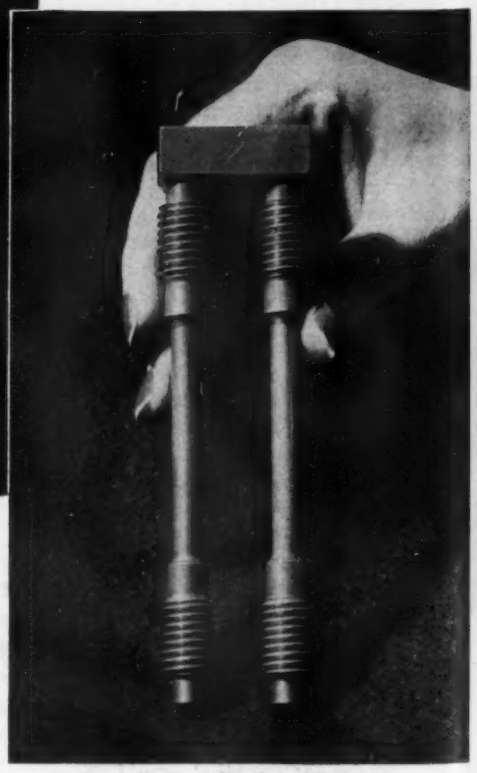
Through development of a suitable mold material and electrically controlled wax-injection machines, an old art becomes a production process for making intricate parts requiring little or no machining



For quantity output of precision castings by the lost-wax process, two requirements must be met: (1) a means of making accurate wax patterns rapidly, and (2) a suitable ceramic mold material. Here a wax-pattern assembly is shown precoated with silica flour suspended in suitable binder

PRECISION CAST PARTS and tools with smooth surfaces, excellent detail and closely held dimensions are being produced by modern refinements in the "lost wax" casting process, an art described in the sixteenth century by Benvenuto Cellini. Sculptors were limited to bronze and other low-melting point materials; dental laboratories developed mold materials that enabled the casting of alloys melting at high temperatures. Extension of the process to items needed in the war effort depended on overcoming two limitations: a suitable mold material and development of electrically controlled machines which accurately reproduce thousands of wax patterns, accurate in every detail. In fact, new equipment had to be developed to handle each operation in the precision casting process.

Because these limitations have been successfully overcome, some current applications of the lost wax method are: permanent magnets, buckets for gas turbines of turbo-superchargers for aircraft engines, and form tools. Ma-



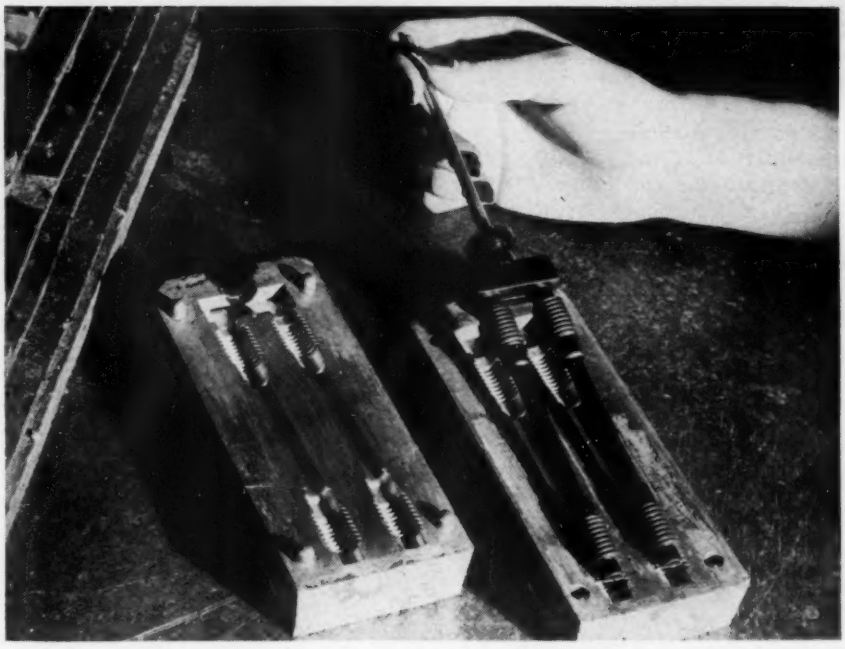
First tooling-up step for repetitive manufacture of wax patterns is to make a master metal pattern incorporating shrinkage allowances for the precision casting

terials such as Stellite, stainless steel, Alnico, iron, copper, aluminum and nickel are being precision cast. Depending somewhat on the metal, tolerances can be held within 0.0002 to 0.0005 in. per in. of linear dimension, detail as fine as 1/300 in. can be reproduced. Production methods have been worked out so that intricate parts requiring extensive machining and those made of materials difficult to machine can be turned out upon a quantity basis and at a reasonable cost.

How "Lost Wax" Process Works

Originally, the "lost wax process" started with a wax pattern, formed by hand to the exact shape desired. This was invested in a plaster cast. When the plaster hardened it was heated; the wax melted out, and there remained a mold that followed exactly all the intricacies of the wax. It was not necessary to separate the mold to remove the pattern, so complicated designs, with many undercuts, could be reproduced. Molten metal was poured into the cavity and allowed to cool and harden. Then the plaster was broken away, and the result was a replica in metal of the wax pattern.

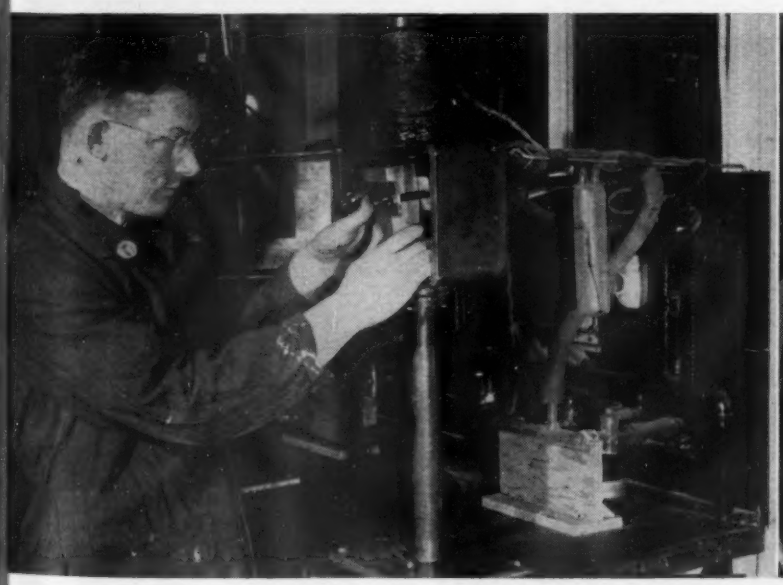
Plaster can be used with low melting point materials such as lead, brass, tin, copper and noble metals but does not, however, stand the high temperatures required to melt iron, steel and the hard alloys. The dental laboratories and also R. H. Thielemann and his associates at the General Electric Research Laboratory developed mold materials suitable for metals with melting points well above 3000 F. The General Electric scientists also devised wax-injection machines and other equipment. Steps in the precision-casting technique now are:



The metal pattern is employed to make a split lead-alloy mold, shown here with a wax pattern being lifted from it

First, a master pattern of the part to be cast is made with proper allowances for shrinkage of the cast metal. From this pattern a split lead-alloy mold is cast which is arranged with dowel pins to insure accurate mating. For complicated parts, the lead alloy mold may contain inserts or may be made in several pieces so that it can be parted to remove the pattern easily. After the lead alloy mold is trimmed and gated, it is ready to use for making wax patterns.

Next, the lead alloy mold, clamped together, is placed in the wax injection machine. The opening in the lead alloy mold fits snugly against a nozzle opening from the hot wax container. With positive air pressure above the wax, and a partial vacuum in the chamber of the machine inclosing the lead-alloy mold, hot wax readily fills the mold cavity when the trip valve is opened. After the wax is solidified, the



Halves of the lead mold are clamped tightly together, placed in the chamber of the wax-injection machine. Melted wax under pressure is fed into the top of the mold, a partial vacuum in the chamber helping the wax to fill the mold completely

Wax patterns are assembled to wax gates and runners by means of a soldering iron, according to the number of pieces to be cast in a single investment

mold is removed from the machine, and the wax pattern is removed from mold. This wax pattern is identical in every detail to the original master metal pattern. According to the number of parts to be cast in each mold, the wax patterns are assembled and wax gates and runners are attached by melting and locally fusing the wax parts together.

The wax assembly is then dipped into a precoat suspension of fine silica flour mixed with a suitable liquid binder. This precoat eventually becomes the smooth interface of the ceramic mold. After the precoated patterns are dry they are placed in suitable containers and the investment, or mold proper, is poured around them. Mold material is a mixture of graded silica sands mixed with a suitable liquid binder. A vibrating machine causes the sand to pack around the coated patterns. When the molds, with the wax patterns inside, have set, they are placed upside down in an oven at 250 F, so that the wax will melt and run out. Finally, the molds are placed in a furnace and heated slowly to 1650 F., ready for casting.

Precoated patterns are placed in metal containers and the mold material—a combination of graded silica sands with binder—is poured around them and allowed to set. When hard, the molds are turned upside down and heated, whereupon the wax runs out leaving a mold cavity exactly reproducing the master pattern

Two Casting Processes Employed

Two types of casting processes are employed. For the pressure process, the metal is melted in a small indirect arc furnace developed by A. W. Merrick, of the Austenal Company. The furnace is heated by radiation from a carbon arc in the center of the spherical melting chamber. When the metal is ready for pouring, the heated mold is clamped, with its opening down, over the pouring hole in the top of the furnace. The furnace is rotated about the axis of the carbons, so that the metal will flow into the mold. Compressed air is admitted to the furnace by an automatic valve to force the metal into the mold quickly. For centrifugal casting, the heated molds are clamped in jigs on a spinning table in such a way that the mold openings mate with outlet holes from a central distributing cup. Molten metal is poured into the distributing cup as the spinning table is revolving at the desired speed. The metal feeds from the distributing cup into the individual heated molds.

After the casting operation, the molds are allowed to cool before the castings are removed. Since some of the mold adheres to the castings, they are sandblasted. Later the castings are cut from the gates with an abrasive wheel, and are ready for use after minor finishing.

Heated to 1650 F., the mold is clamped with its opening over the pouring hole of an indirect arc furnace, the furnace is rotated about the axis of the carbons, and the molten alloy enters the ceramic mold

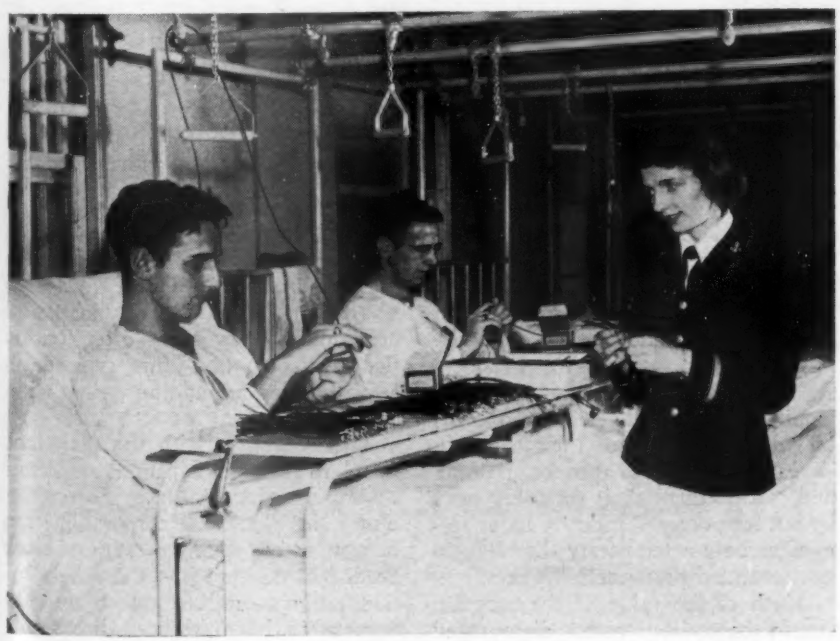
Red-hot Milling Chips

ONE SURPRISING FEATURE of high-speed milling on steel, is the appearance of the chips as they leave the work. They are frequently red hot and give the appearance of chips from a coarse grain grinding wheel. They are naturally blue when cooled. Except on thin work, nearly all the heat seems to go into the chips. Both cutter and work remain comparatively cool. When the length of time the cutter is in contact with the work is short, the cutter has a chance to be cooled in the air between contacts with the metal. This is particularly true where the cutter body is large and there are few teeth in the cutter. In all milling considerations the thickness of the chip, or the feed of the work *per tooth* is one of the most important points to be considered.

Industrial Training Speeds Rehabilitation

Convalescing service men need activity, exercise and training. Arma Corporation combined these needs and now trains service men while they recuperate

Commander H. B. Arnold, head of the physiotherapy department, Brooklyn Naval Hospital, watches combat wounded convalescents doing jobs which fit into the therapy prescribed for each. Work of this sort both aids the men to overcome handicaps and trains them for jobs upon their discharge



Working as a team to prepare wires for gun fire control equipment, two men alternate at clipping and snapping on lugs and have produced as much as the average plant worker. Ensign Harriet Jones, head of the St. Albans Naval Hospital occupational therapy division, supervises their work

UNDER A PLAN that combines occupational therapy and industrial training, The Arma Corporation is laying the foundation of a system which can speed the return of disabled service men to useful civilian employment, facilitating their resumption of economic self-sufficiency.

For many years, convalescents whose injuries have left them without full physical efficiency have been given courses of prescribed activities to limber and strengthen the ailing parts. Typical of these have been basket weaving to increase finger dexterity, peg driving to restore the use of broken elbows and foot-treadle-loom weaving to flex stiffened leg muscles. This type of therapy prompts the desired use of the body, but in the case of service men worrying about their futures and yearning to be about the business of earning a living, it leaves something to be desired.

Employment Lag Resulted

When the man is finally discharged from the hospital, and subsequently from the armed services, he may still be, in view of the nature of his injury, an untrained worker. Even with the best of handling, several weeks must elapse before he can have been trained to take his place in civilian employment as a productive member of society. During the interim, he and his family may be on relief, or consuming their savings.

Now comes the Arma Plan: The physician in charge prescribes a certain type of muscular exercise for a patient. The therapy technician interprets this in terms of industrial productivity available—instead of in terms of made-work activities; and

the patient is visited by the industrial training specialist who furnishes him with tools and raw material, and instructs him in their proper use.

From there on, with increasing proficiency and under careful supervision, the convalescent works, feeling once more that he is a valued cog in the industrial machine, and not merely an about-to-be-jobless veteran. His morale is raised, while he's exercising the afflicted parts with much more interest and zest, for he understands and sees real value to the work he's doing.

And his morale is further raised by the realization that, upon being discharged, a place awaits him in the training department of the Arma Corporation, where he'll be given further instructions and fitted into a type of work for which his physical capabilities suit him.

Training Paces Recovery

As the convalescent recovers, the physician may shift him to progressively harder or more intricate types of exercise. Again, the technician and industrial training specialist will collaborate in furnishing productive activity to suit this need. When the man is considered cured he may have progressed through several steps of the assembly line, mastering each as he goes.

While convalescing, and later when they come to the Arma Corporation for further training and inclusion in the firm's working force, veterans will be taught blueprint reading and the use of measuring instruments. Their training will be the same as that of any able-bodied worker. Their limitations will be considered, but only in order to arrange to overcome them.

According to the memorandum of the Third Naval District, describing the plan, it is "an extension of industry's interest in the handicapped as a source of labor supply. This program would also provide additional training for personnel returned to limited duty within the naval establishment."

Memo Summarizes Aims

The same memorandum recognizes as "the primary objectives of this program: (1) Physical restoration of the patient, (2) Psychological well-being and healthy mental state of the patient and (3) The economic well-being of the patient in terms of purposeful activity as a participant in the economic field.

The question of payment for services has been a difficult one to settle. The arrangement was entered into with Navy authorities, to carry on vocational training at the bedside of selected service men, and that Arma would pay each the regular rate for his output.

Robert F. Nelson, vice-president of Arma Corporation and conceiver of the plan to train and rehabilitate the wounded simultaneously, believes its adoption by the over 100,000 United States war plants would solve a phase of the manpower problem and supply to industry more than a million men

The production of naval equipment by disabled sailors is particularly fitting, for Arma has been a Navy supplier for the past 25 years, turning out instruments which these men have used and can understand.

Arma Corporation Vice President R. F. Nelson, originator of the plan, would have disabled veterans—no matter what the extent of their handicap—realize that with proper training and readjustment their disability need be but temporary. "Industry today recognizes only a temporary disability in our wounded personnel," he says.

Much of the value of the program lies in the realization that discouraged and long-unemployed men often lose interest in working and become unemployable, drifting constantly downward in the scales of effort and productivity. Advocates of this program would have industry reach into the base hospitals and aid veterans in their efforts to prepare and readjust themselves for continuance as productive members of society. The benefits to industry of such a program are seen to be two-fold, when we consider that a non-productive worker—often on relief—is like a non-firing cylinder in a gasoline engine: adding weight without imparting any power.

Those familiar with the plan look upon Arma's participation as merely a scraping of the surface: no one industry, let alone one corporation, can furnish all the different types of work needed to dovetail into the rehabilitation program and to absorb the veterans after they have been discharged.

Pleased with the success of their proposal to date, Arma officials have hopes that the plan will be generally adopted by industry.

Practical Ideas

FROM PRACTICAL MEN

★ **War-Winning Suggestions appearing on these pages were selected from those recognized as meritorious by the Board of Individual Awards, War Production Drive. They are freely offered to industry as an aid to war production** ★

A handwheel is clamped to the top plate of this fixture, which is oscillate by hand so that a form tool can burr the rim, spokes and hub in one operation

Handwheel Spokes Burred on the Drill Press

BY EDWARD C. LORENTZ
Caterpillar Tractor Co.

A handwheel for a howitzer carriage is blanked and pierced from 5/16 in. steel plate and must have the edges of the rim, spokes and hub rounded to smooth surfaces free from burrs. The corner rounding operation was previously done with a file at the rate of seven pieces in eight man-hours. The illustrated fixture and tool does the work on the drill press at the rate of five pieces an hour, or a production increase of approximately 600 percent.

The fixture consists of two steel plates *A* and *B* which can be moved relative to each other by two levers *C* and *D*. Tool *E* is a reworked reamer ground with a pilot and a concave cutting edge having radii that rounds the corners on both sides of the handwheel at one time. The bottom plate of the fixture has a pilot bushing to fit the pilot on the cutting tool. The top plate, which is fastened to the bottom plate by two links and two levers, is fitted with plug *F* and two pins *G* for locating the handwheel. A slip washer and nut on the plug clamps and handwheel in place.

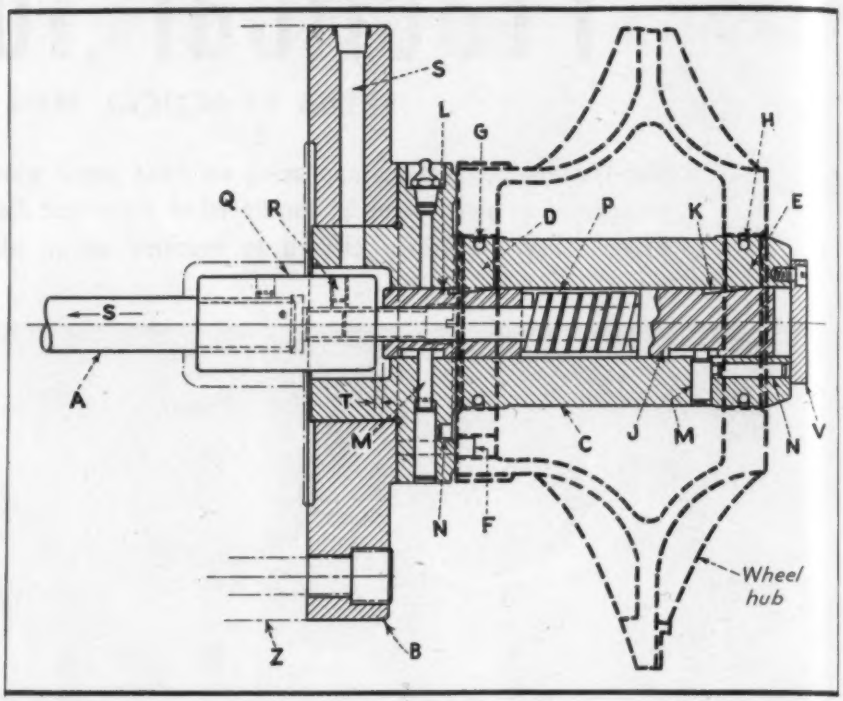
To operate, bottom plate *B* is clamped to the drill table with the pilot bushing directly in line with the drill spindle. The handwheel is clamped to plate *A* with one

spoke between locating pins *G*. The operator sets the tool and locks the drill spindle, and then feeds the work into the tool by manipulating levers *C* and *D*. Lever *D* moves the top plate to the right and left of the operator, while lever *A* moves it toward and away from the operator. *War Winning Suggestion from the Board of Individual Awards, War Production Drive.*

Expanding Arbor Cuts Lathe Set-Up Time

BY F. SERVER

We designed the illustrated lathe spindle fixture to reduce set-up time to a minimum when machining the indicated diameters at the periphery of a wheel hub. The fixture secures the work in place by having a draw-in bar *A* passing through the spindle of the machine.



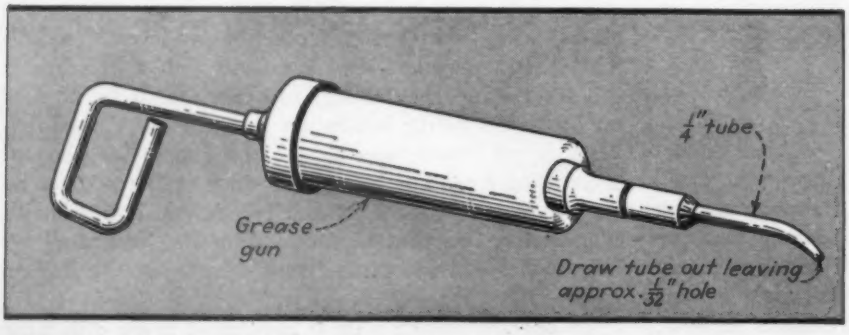
This fixture mounted on the spindle nose of a lathe is actuated by a draw-in bar. It permits setting up a wheel hub in minimum time for turning operations

The faceplate on the spindle nose is partially indicated at *Z*. To this is attached by means of screws and dowels an adaptor plate *B* in which is mounted work holding arbor *C*. Three expanding pins *D* at the left end of the arbor, and three expanding pins *E* at the right end of the arbor, grip and locate the work radially, while driving pin *F* enters a hole in the end of the wheel hub. The hub and holding elements of this fixture are cylindrical, although only one view is shown in the drawing. Pins *D* and *E* are retained in place by springs *G* and *H*, respectively, that lay in a groove cut around the arbor, and bottom in slots cut in the pins.

Rod *J*, which is free to slide lengthwise in the center hole, has three beveled flats *K* to contact the ends of pins *E*. At the other end of the arbor, a slidable sleeve *L* is provided; this also has beveled flats to contact the ends of pins *D*. Dog-point screws *M* prevent sleeve *L* and rod *J* from turning in the arbor, since they enter slots in the sleeve and rod, and are locked in place by two screws *N*. Spring *P* between sleeve *L* and rod *J* forces the sleeve and rod apart, this being the means employed to release and clamp the work-holding pins *D* and *E*.

Threaded coupling *Q* between the threaded end of rod *J* and draw-in bar *A* is locked by screw *R* after the entire fixture is adjusted on the machine, hole *S* being provided so this can be done from the outside of the fixture. End plate *V* keeps dirt out of the arbor, and acts as a stop.

When using this fixture, the wheel hub is positioned over the arbor, locating one end hole over pin *F*. Draw-in bar *A* is then pulled in direction *S* by a handwheel. This causes beveled rod *J* to expand pins *E* and clamp that end of the work, while at the same time spring *P* causes beveled sleeve *L* to expand pins *D* and grip the other end of the work. When draw-in bar *A* is released, spring *P* first pushes sleeve *L*, holding it tight in the work until rod *J* releases pins *E*. In doing this, coupling *Q* comes against sleeve *L*, thereby reducing distance *T* to zero. Continued movement of rod *A* releases pins *D* by moving sleeve *L* to the right.



Copper tubing brazed to a small grease gun can be used effectively to squirt white lead in center holes in shafts being turned on the lathe

Grease Gun Adapted For Oiling Lathe Centers

BY ERMAN SOUTER

White lead used as a lubricant on lathe centers and in making press fits is usually kept in an open can and applied with a small brush. Chips, dust and dirt that settle on the white lead in these open containers frequently cause trouble when the white lead is used. Also, when a small shaft is mounted between centers on a lathe, it is diffi-

cult to add more white lead to the center hole, unless the workpiece is supported by hand to back out the center.

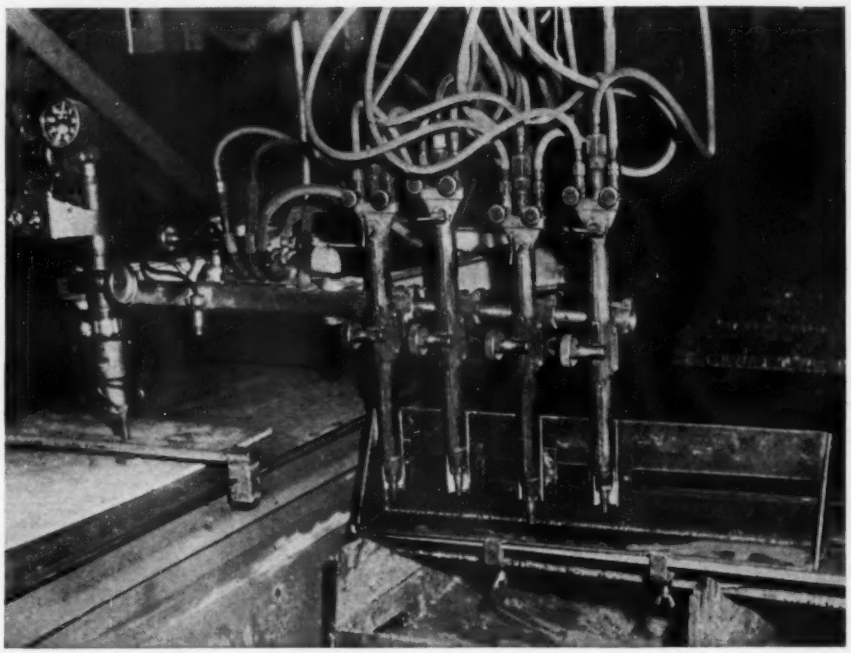
To overcome these difficulties, I brazed a short piece of copper tubing to the end of a small automobile grease gun as shown in the drawing, and drew the end of the tubing down to a small point. Small but specific amounts of white lead can be squirted from the gun. The remainder will stay clean and will not dry out. It is a simple matter to squirt white lead in the center hole of a shaft by backing out the center just enough to open a crack at the bottom of the center. White lead mixed with a good grade of grease instead of oil can be squirted in the center hole of a shaft hot from machining, and the center closed up before the white lead melts and runs out.

Gage Sets Flame Cutting Torches Quickly

BY HARRY SCHOENHAUT
Kaiser Company, Incorporated

Tips of the torches on flame-cutting machines are usually set by eye along the edge of a scale, after which perpendicular adjustment is made. This proved to be a time-consuming operation on a machine having four torches; therefore, the illustrated gage was designed to speed the operation. Adjustments that previously required up to half an hour now take but three minutes.

The gage, made from steel plate braced with gussets at each end, is clamped to the table of the flame-cutting machine. The vertical member of the gage is slotted to receive four sliding saddles which can be set accurately and quickly with a scale at any desired location. These saddles are contoured to fit the cutting torches which are automatically positioned vertically when the saddles are clamped to the gage. Additional saddles can be added when it is necessary to use more than four torches, and the gage can be increased in length, to set the torches on wider centers. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



Flame-cutting torches can be set quickly in vertical position and on exact centers with the aid of this gage

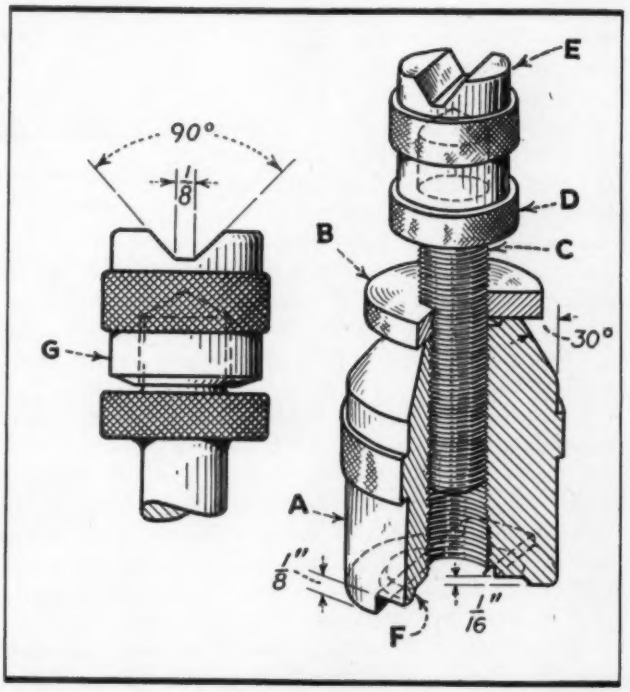
Thumb Jack Supports Long Work for Milling

BY R. S. BUSTAMANTE

The thumb jack shown in the drawing was designed to support long work mounted between a dividing head and tailstock set on a milling machine table. It has two main features: First, it has a keyway in the base, and, second, it has a jackscrew with 20-pitch threads.

Base A is made of 1½ in. cold-rolled steel 2⅛ in. high. It is knurled and is tapered to a 30 deg. angle at the top. It is tapped for the ½ in. 20-pitch threads on the lift screw, has a ⅝x⅛ in. keyway at the bottom, and is relieved 1/16 in. deep at the base for a diameter of 1 in. Locknut *B* is 3/16 in. thick and 1 3/16 in. diameter and it is knurled for finger grip. Lift screw *C* has a knurled adjusting flange *D* 1/4 in. wide and ⅜ in. down from the top, and is threaded for a length of 2 in.

Caps *E* and *G* are almost identical in outside appearance, are 27/32 in. in diameter, and each has a knurled



This thumb jack supports long work held between dividing head centers on a milling machine. The lift screw has ½ in. 20-pitch threads

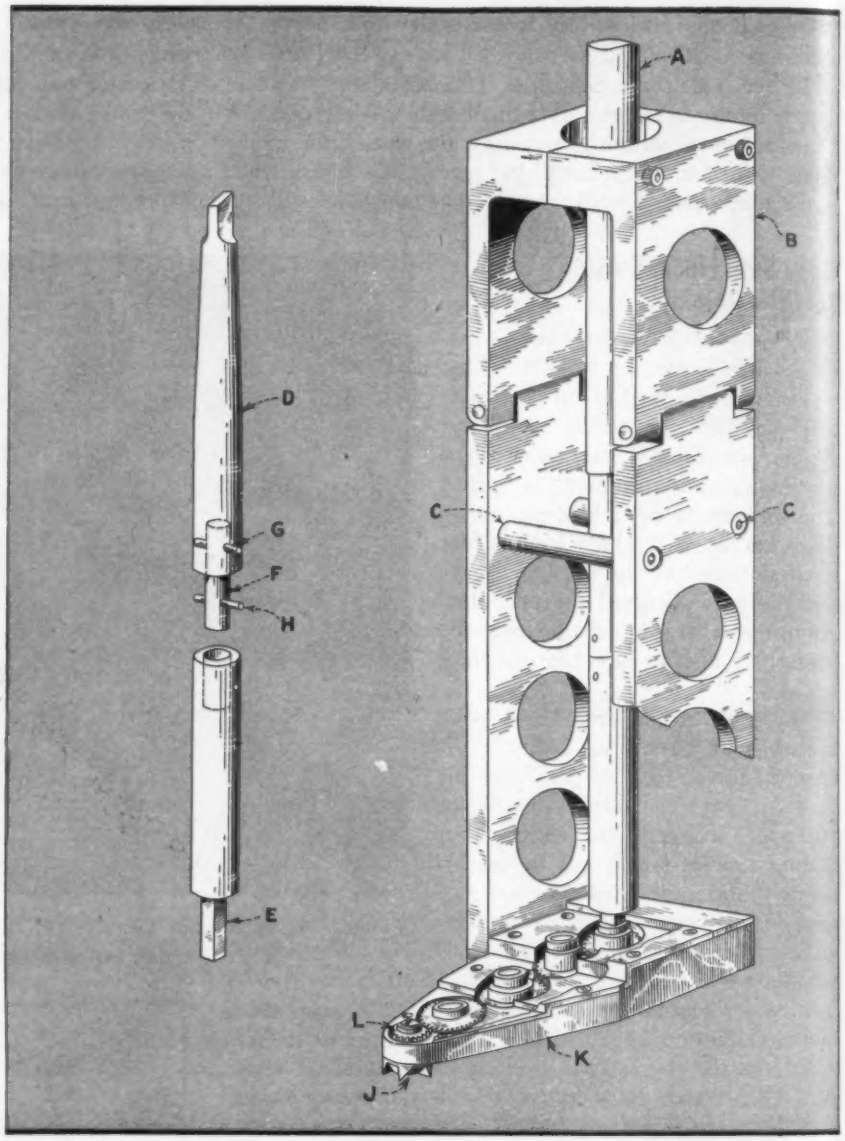
flange ¼ in. wide and ⅞ in. diameter at the center. Both caps have 90-deg. V-notches at the top, which are milled to a depth of 3/16 in. with a ⅛ in. flat at the center. Cap *E* is bored for a running fit on the top of screw *C*, the depth of the hole being such that the cap rests solidly on knurled flange *D*. Cap *G* is bored 1/16 in. larger than the diameter of the top of screw *C* and it does not rest on flange *D*, there being 1/16 in. clearance. Thus cap *G* is free to adjust itself to pieces of irregular shape.

Spotfacing Tool Reaches Offset Holes

BY G. F. BERNADT
General Electric Company

The illustrated fixture was designed to save time in back spotfacing and spotfacing offset holes. It functions through the spindle of a drill press and the basic principle of gearing cutters, which is not new. However, the method of preventing the fixture from rotating with the spindle, and thus being able to operate it in the manner of a drill is novel for this particular operation.

The fixture is constructed so that it may be clamped to any drill-press spindle. It is driven from the spindle through three-piece shaft *A* and a spur-gear train, with all speeds set on the drill press and the operator hand feeding as required. The clamp and collar *B* of hinged and split construction facilitates assembly of the fixture on the drill press. The split collar is machined to fit the non-revolving part of the drill-press spindle, and is secured in position by two screws. The hinged part of the clamp provides clearance for the collar. Braces *C* keep the uprights of the fixture from spreading.



This tool, designed for use on a drill press, will not rotate with the drill press spindle. It will enter spaces 1 in. high for spotfacing offset holes

Operation of the fixture is effected in the same manner as any counterbore. The driver is in three parts: a tapered portion *D* which fits the drill spindle; a square section *E* which fits the center of the main driving gear in the fixture; and dowel *F* that connects the two parts of the driver. This dowel is secured to the tapered section by steel pin *G*, while the square section is secured by brass pin *H*. The latter pin shears under excessive strain.

Spotface cutter *J* is driven by the enclosed gear train actuated by the driver from the drill press. Front section *K* of the fixture is made in more than one length to permit spotfacing holes of varying degrees of accessibility. Face length of the driving gear and the first intermediate gear is thicker than the other intermediate gears which accounts for the step construction of the gear housing. End pinion *L* has a square center into which the spotface cutter, which is tapped. It is inserted and secured to the gear by means of a small screw. A fiber thrust washer between the gear housing and the cutter separates the cutter for the gear box during operation. Proper size pilots may be screwed into the spotface cutter.

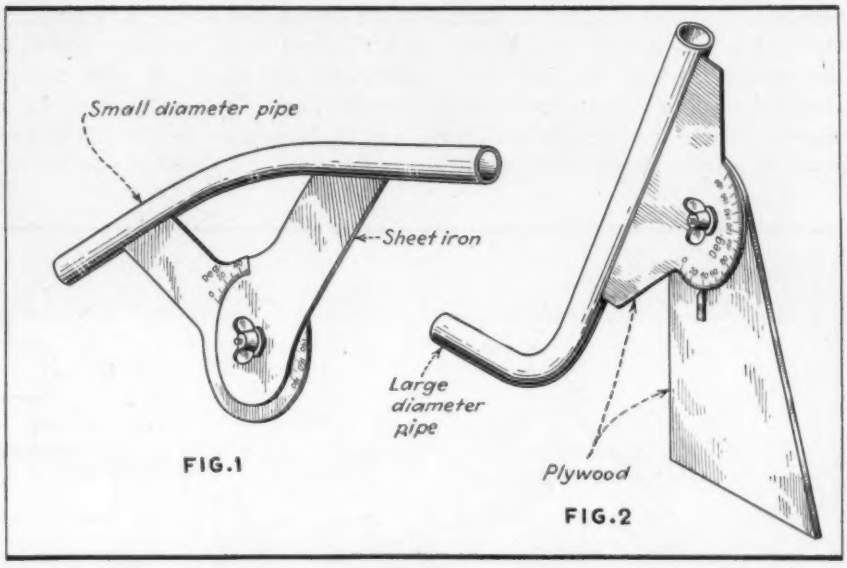
Angle Gages Check Accuracy of Pipe Bends

BY W. P. WATTS
Oregon Shipbuilding Corporation

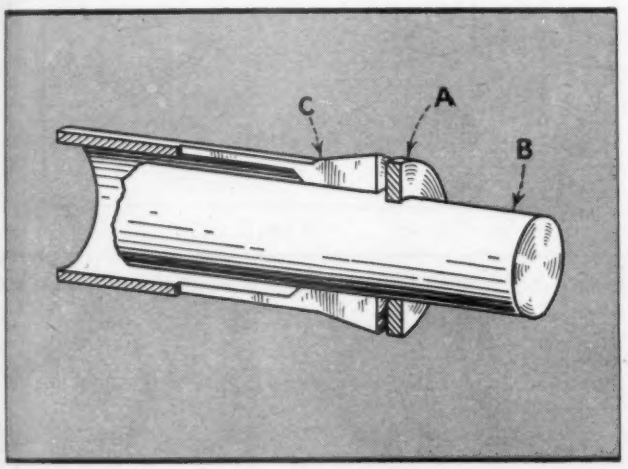
When measuring the degree of pipe bends, it is usual practice to employ the center method, requiring the use of a combination square and protractor after leveling the pipe on a surface plate or table. Because this is slow and

laborious, the illustrated angle gages were made, the calibrations being taken from the quadrant of a pipe bender.

The legs of the gage shown in Fig. 1 are made of heavy-gage sheet iron and are pivoted about a stove bolt with a wing nut for locking. The quadrant will be exposed by one of the disks as it rotates on top of the other disk. This gage, used for pipes of small diameter, is read when the legs rest tightly on the straight sections of the pipe. The gage shown in Fig. 2 is similar to the other, but is larger and is used to measure bends on pipe of large diameter. It is made of ⅜ in. plywood finished natural with graduations marked with India ink over two coats of white shellac. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



These angle gages are used to check pipe-bend angles and eliminate the use of a combination square and protractor



A thin washer placed on stock and adjacent to a collet will prevent chips from working into the collet. Long runs can be made without cleaning chips from the collet

Washer Prevents Collets from Collecting Chips

BY OSCAR M. STIEGLER

When machining stock held in collets, chips frequently work into the collet and lodge between the stock, the collet and the collet holder. In order to make the stock run true, it then becomes necessary to remove the stock and collet and clean out the chips. This happened too frequently on a job when I was making ⅝ in. drill bushings from drill rod.

Finally, I made washer *A*, ⅛ in. thick and reamed to the size of drill rod *B*, and pushed it on the stock flush against collet *C*. A complete run of 40 drill bushings was made without once stopping the machine to clean chips from the collet. Since then, washers have been made for drill rod from ¼ in. to ¾ in. diameters, which sizes are used in our shop for a variety of drill bushings.

Adaptors for Riveter Eliminate Hand Work

BY RAY M. WILLIAMS
Northrop Aircraft, Incorporated

Adaptors *A* shown in the illustration were designed for one-shot riveting machines, and are used when riveting two narrow channels together—inside flange to inside flange. They also facilitate the riveting of Z-sections, hat-

These C-shaped adaptors for one-shot riveting machines eliminate hand riveting of narrow channels, Z-bars, hat-sections and other intricatedly shaped parts

sections and other intricately formed parts. These adaptors replace the conventional straight sets and anvils used with the one-shot riveters. The deep C-bend allows the legs of channels to mate exactly without interference from the adaptors of the machine while riveting. The adaptors are made in several sizes and shapes.

It is possible to now do work with the one-shot riveting machine which previously had to be done with hand tools. For example, in riveting two narrow channels together, even the ordinary rivet gun and bar set could not be used. This work had to be specially planned and the rivets were set by hand.

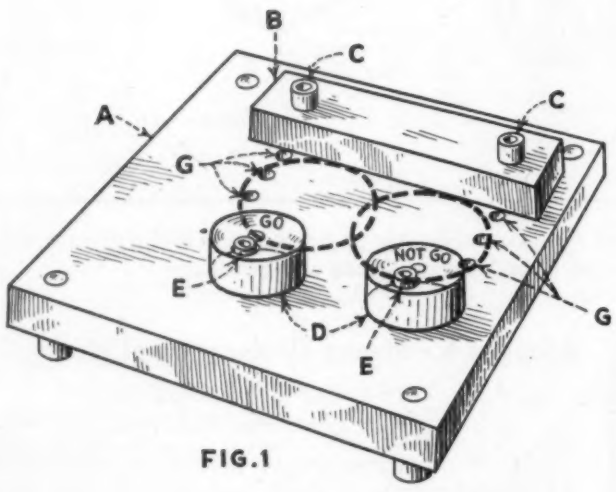


FIG.1

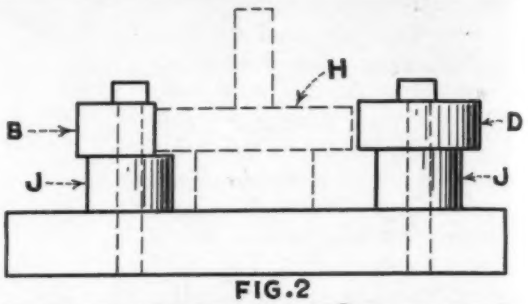


FIG.2

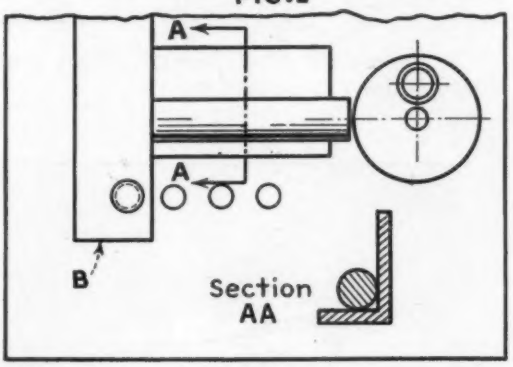


FIG.3

Adjustments of this limit gage can be made by setting disks that are fitted eccentrically to a base plate. It can be used to gage flat and irregular shaped parts

Limit Gage Has Wide Range of Settings

BY LOUIS de L. BERG

A simple but effective "Go" and "Not Go" limit gage is shown in Figs. 1 and 2, which are plan and elevation views respectively. Case hardened base plate *A* has four pins set in the corners for supporting legs. A strip of tool steel *B*, hardened and ground all over, has two holes drilled accurately on a line midway between the center line and the right-hand edge. Strip *B* is fastened to the base plate with capscrews *C*. Tool-steel disks *D*, drilled and reamed centrally for use as work holes when regrinding, are drilled and counterbored eccentrically to take capsecrews *E* that engage tapped holes in base plate *A*. The base plate is also drilled and tapped with holes *G* used in attaching strip *B* at various locations. The purpose in drilling two holes in strip *B* off center is to give a wider range of settings by turning it end for end.

The gage is set up by first bolting strip *B* to the plate in the pair of holes that will bring the edge of the strip at that distance from disks *D* which is approximately equal to the diameter of the piece to be gaged. Precision blocks are then built up to the "Go" dimension and placed between strip *B* and the "Go" disk. This disk is then rotated until its edge just contacts the blocks, after which it is locked by setscrew *E*. The "Not Go" disk is set in the same manner.

The heavy dash lines represent washers to be gaged. When a washer is slid along the surface of plate *A* it will, if within tolerance, pass the "Go" gaging disk, but will be stopped at the "Not Go" disk. Plate *A* is so proportioned that the distance from the front edge to center of the "Go" disk is equal to the maximum diameter of the work that can be accommodated, thus providing sufficient working space when sliding the washers to the gaging points.

This gage may be used for checking pieces *H* of irregular shape, as shown in Fig. 2, by raising strip *B* and disks *D* to the necessary height, using collars *J*. Length dimensions can also be gaged by providing a cradle, shown in section AA of Fig. 3. This cradle, which is finish ground, and the part to be gaged must be pressed firmly against the edge of strip *B*.

The surfaces of plate *A*, strip *B*, and the gaging disks are all subject to wear. Slight wear, as evidenced by checking with gage blocks, can be compensated by adjusting the disks with capscrews *E*. Excessive wear on strip *B* or plate *A* can be remedied by re-finishing on a surface grinder. Should the disks become badly worn, they can be refinished on a cylindrical grinder.

Interchangeability Aids Production And Salvage of Lancaster Bombers

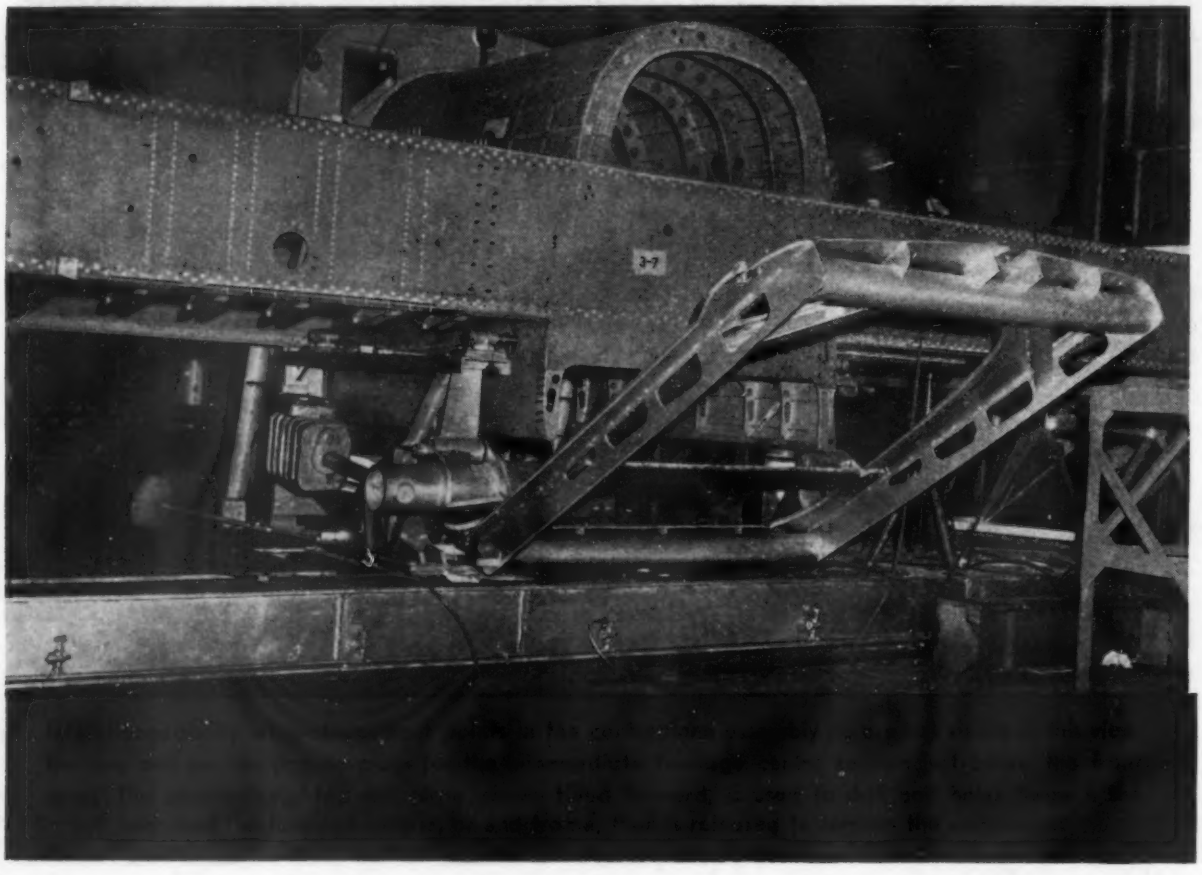
Victory Aircraft Ltd., Malton, Ontario, is producing the famed Lancaster four-motor bomber to interchangeability standards established by the British Ministry of Aircraft Production. More than 100 subassemblies produced in Canada are fully interchangeable with similar components produced elsewhere in the Empire. This feature, a definite policy of M.A.P., keeps fighting formations at maximum effectiveness through rapid repair of damaged planes

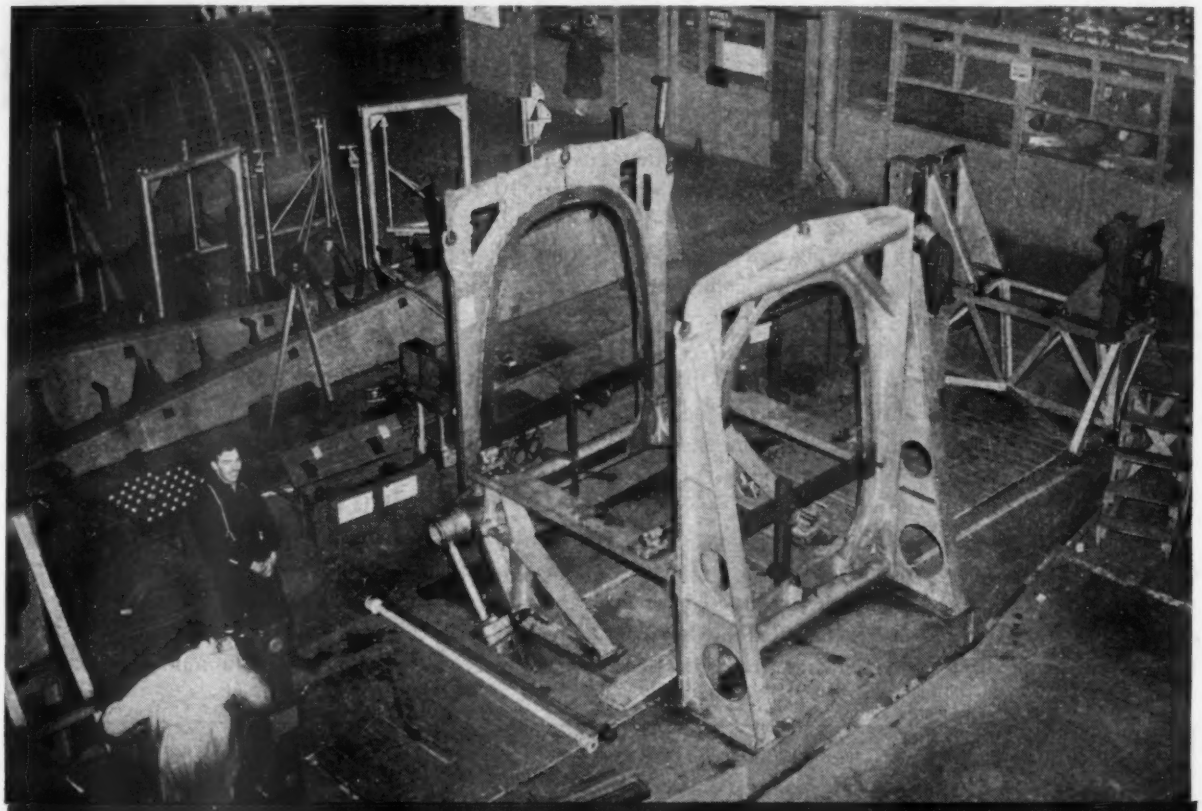
INTERCHANGEABILITY is regarded in England as contributing largely to victory in the Battle of Britain. For in that epic struggle the RAF might well have been overwhelmed if damaged fighters could not have been returned to the fray in a matter of hours.

Rare foresight dictated the policy of interchangeability. It once helped prevent invasion, each month it now gives the RAF many salvaged planes with which to carry the fight to the enemy.

As underlying policy of the Ministry of Aircraft Production, interchangeability has influenced the design and tooling for current operational types. The world-renowned Lancaster, developed in 1940 by A. V. Roe & Company, Ltd., in England, is 100 percent interchangeable for all main components. This means that any damaged component can be replaced quickly in the field without trimming and without reaming the bolt holes. A fuselage section, for example, can be replaced in two hours.

It might be thought that interchangeability is an expensive and time-consuming process. That does not appear to be the case, judging from operations at the Victory Aircraft Limited, Malton, Ontario, a government-operated plant now making the Lancaster. Spread over a production contract, the cost of the interchangeability equipment is not high—it was approximately $250 per plane based upon the first 1000 Lancasters made in England. Jigs for components must be rigid, of course, but mating jigs are not required for joining up the sections of the fuselage. The fuselage sections are merely placed on four-wheeled trolleys and butted together. To align bolt holes in mating formers, or end frames, the trolleys can be raised or lowered by a jackscrew at each





corner. When the end frames are aligned, several score connecting bolts are readily push-fitted in place. This may be considered an important accomplishment in aircraft production, because some of the sections are 24 ft. long.

Interchangeability is achieved in England and also in Canada by rigid jigs in which locating points are non-adjustable. The English plants are prone to use cast iron for jig frames, but Victory Aircraft employs welded-steel jigs designed to known deflection or twist under load, and built up from standardized elements wherever possible. With few exceptions, it is possible to move these jigs to a new location with either one or two sturdy lift trucks. And the jigs provide maximum accessibility for operators as well as for unloading.

Victory Aircraft is of course in production of Lancasters but has not yet reached peak output. It is perhaps too early to venture an opinion concerning what the combination of interchangeability equipment and bridge-designed jigs will accomplish in reducing man-hours. One thing, however, will be certain—any component produced in Canada will be interchangeable with the product of English plants. How this is accomplished can be made known by considering the English system for securing interchangeability and its application by Victory Aircraft.

Interchangeability Schedule

When the Ministry of Aircraft Production orders a new aircraft to certain specifications, the contract provides that the sixth production-built and all subsequent aircraft must be fully interchangeable. A separate contract authorizes preparation of an "interchangeability schedule" and building of interchangeability equipment (gages and jig references) in sufficient quantity to cope with the production schedule at all plants involved. Once approved by M.A.P., the interchangeability scheme governs not only the output of the original contractor but of all other vendors who may subsequently be drawn into the procurement program.

Time is purposely allowed between approval of the mock-up and the sixth production plane for the contractor to perfect the interchangeability schedule and equipment. One of the earliest and most vital steps is to prepare interchangeability data sheets for all main components. These data sheets consist of schematic views of the components showing only dimensions and limits for points of attachment, and

have the initial advantage of showing up impractical tolerances and clearances which are corrected before tooling is commenced.

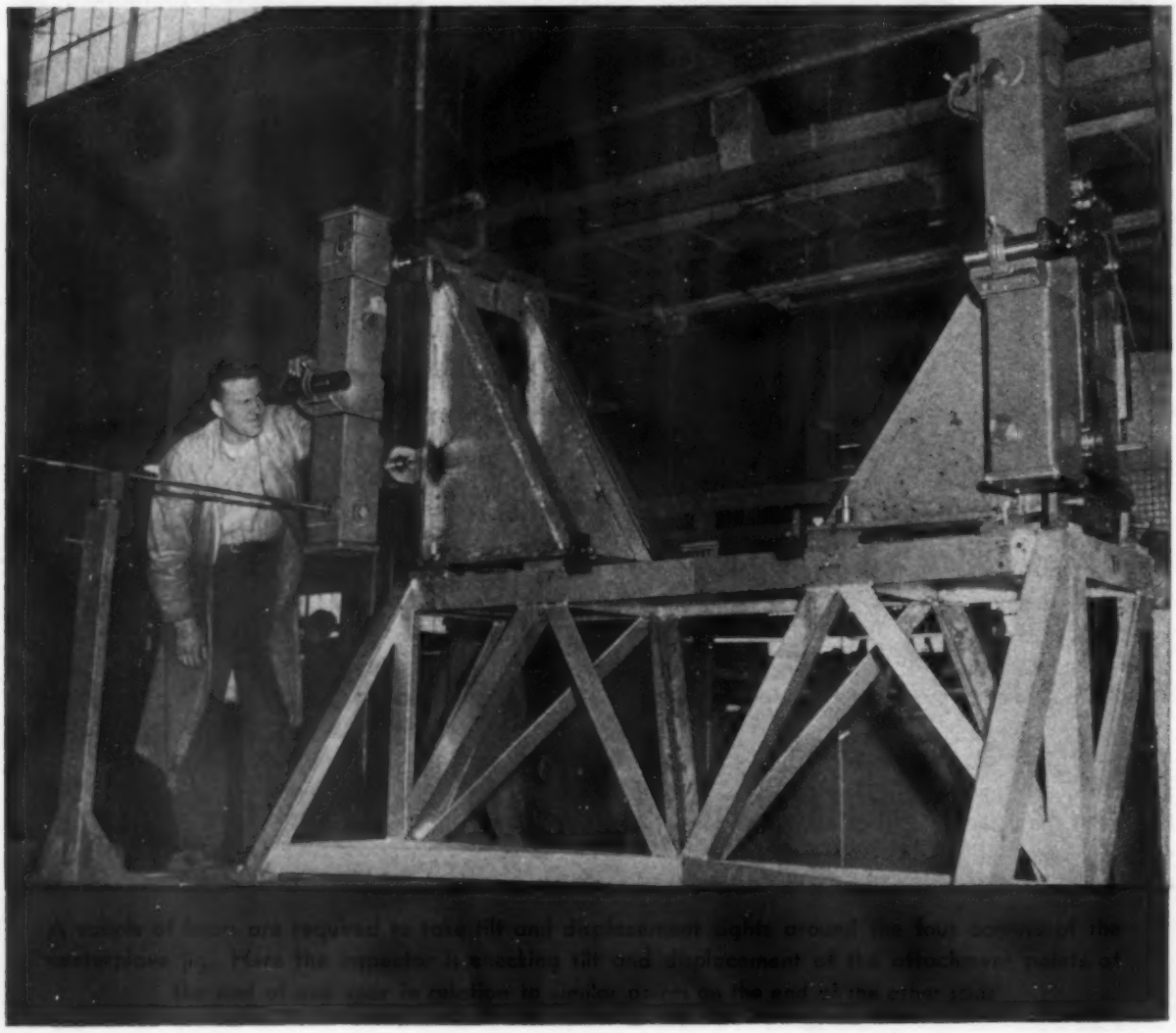
Decisions concerning the type and quality of the gages and jig references can now be made. The interchangeability schedule is completed by preparing a list showing the following: (1) Number of the schematic interchangeability drawing, (2) name of component, (3) drawing number for component, (4) features of component gaged or referenced, (5) whether gage or reference, (6) government identification number for the gage or reference, (7) contractors' equivalent tool drawing number, and (8) whether the media are applied to the component or the assembly jig, and the number of gages or references of each kind in existence.

Selection and design of interchangeability equipment must be approved by the Aeronautical Inspection Directorate of M.A.P. Tool design proceeds concurrently and the tool designer is aided by having before him the key dimensions that must be controlled in manufacture. Five types of equipment are employed:

1. *Drill references.* These are masters from which production drill jigs are drilled, reamed, bushed and inspected. In the case of spars and other members over 10 ft. long, and where the limits on essential dimensions are very exacting, the drill references and the drill jigs are made of duralumin to compensate for temperature changes. This practice avoids parts that will not fit: differential expansion of a 30-ft. dural spar in a steel jig amounts to 0.046 in. between 60 and 80 F.

The dural drill plates float on a steel bed. Later in the assembly fixture the drilled spar is picked up by a fixed point at one end (usually the inboard end) and by floating points at intermediate stations.

2. *Mechanical jig references that check jigs, not components.* These are commonly used for large subassemblies that are too bulky or heavy for gaging and involve close tolerances. Jig references are castings, sometimes made from scrap aluminum but most fre-

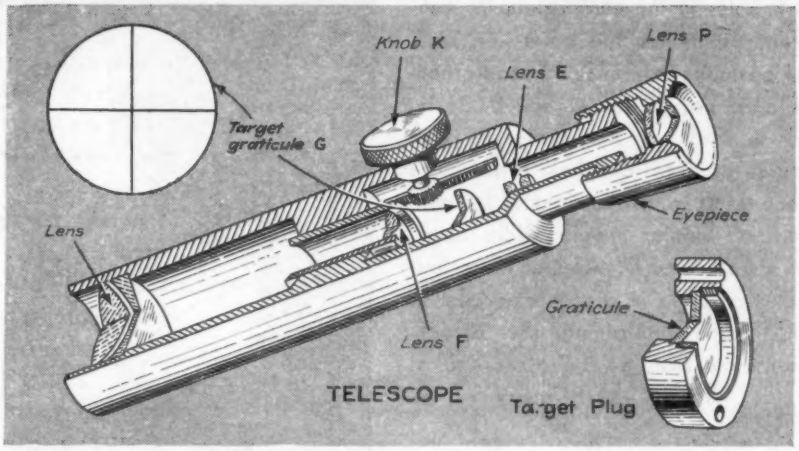


A pair of [illegible] are required to [illegible] and displacement sights around the four corners of the centerplane jig. Note the inspector is checking tilt and displacement of the attachment points of the end of one spar to relative [illegible] to similar points on the end of the other spar.

Telescope

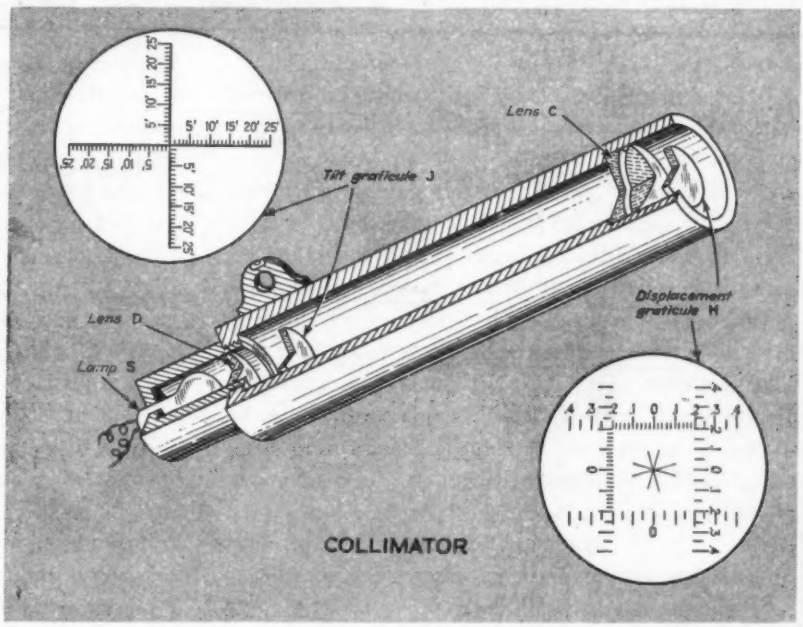
An image of the observed object is focused on graticule G, (cross-hairs on glass) by racking lens F with knob K. Lenses E and P form a microscope for observing the image in relation to the crosshairs. To measure tilt, lens F is racked to an infinity stop at right; to measure displacement, lens F is racked to the left until an image of the displacement graticule H in collimator is focused on graticule G.

Displacement of intermediate points can be checked by placing the target plug in a suitable mounting. In contrast with the piano-wire method, sag is not a factor with the optical-target system.



Collimator

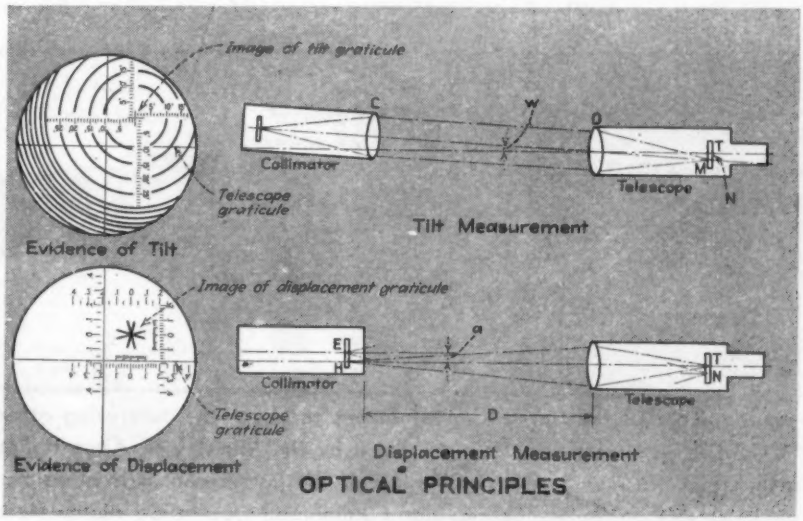
The collimator is a device for throwing a light beam in which all rays are parallel. Thus a ray of light passing through any point of graticule J is caused by collimator lens C to be parallel with any other ray. Tilt graticule J has a central cross with four scales at right angles. Each scale division represents 30 seconds, but the size of the graticule permits estimates of tilt to one-fifth of a scale division, or six seconds of arc. Another graticule H is mounted outside collimator lens C to measure displacement. Six sets of graduations are arranged in a square, surrounding a central star. Graduations of 0.10, 0.05, 0.02 and 0.01 in. are available among the several scales. The central star consists of four V's placed 90 deg. apart. Crosshairs of the telescope graticule can be set into these V's so accurately that very small displacements—one-tenth of the smallest scale division, or 0.001 in.—can be detected at a distance of 80 ft. if shop temperature is uniform.



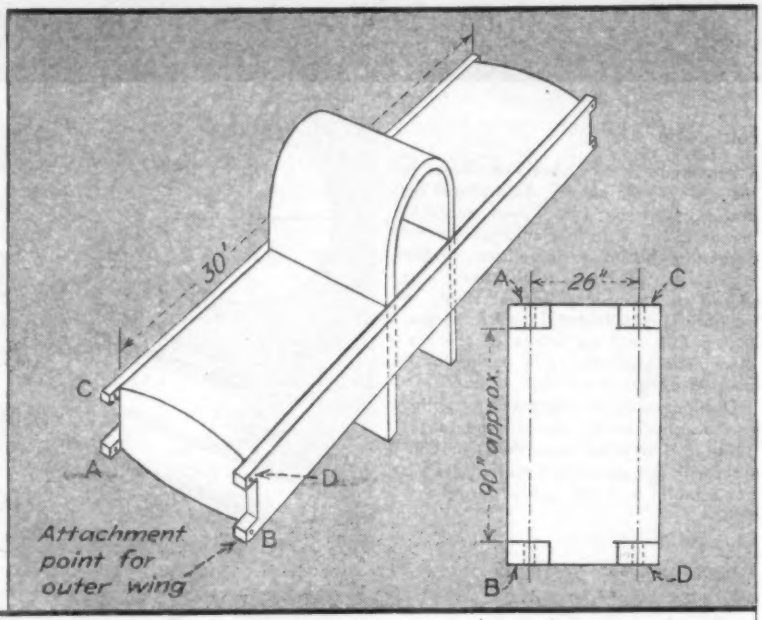
Optical Principles:

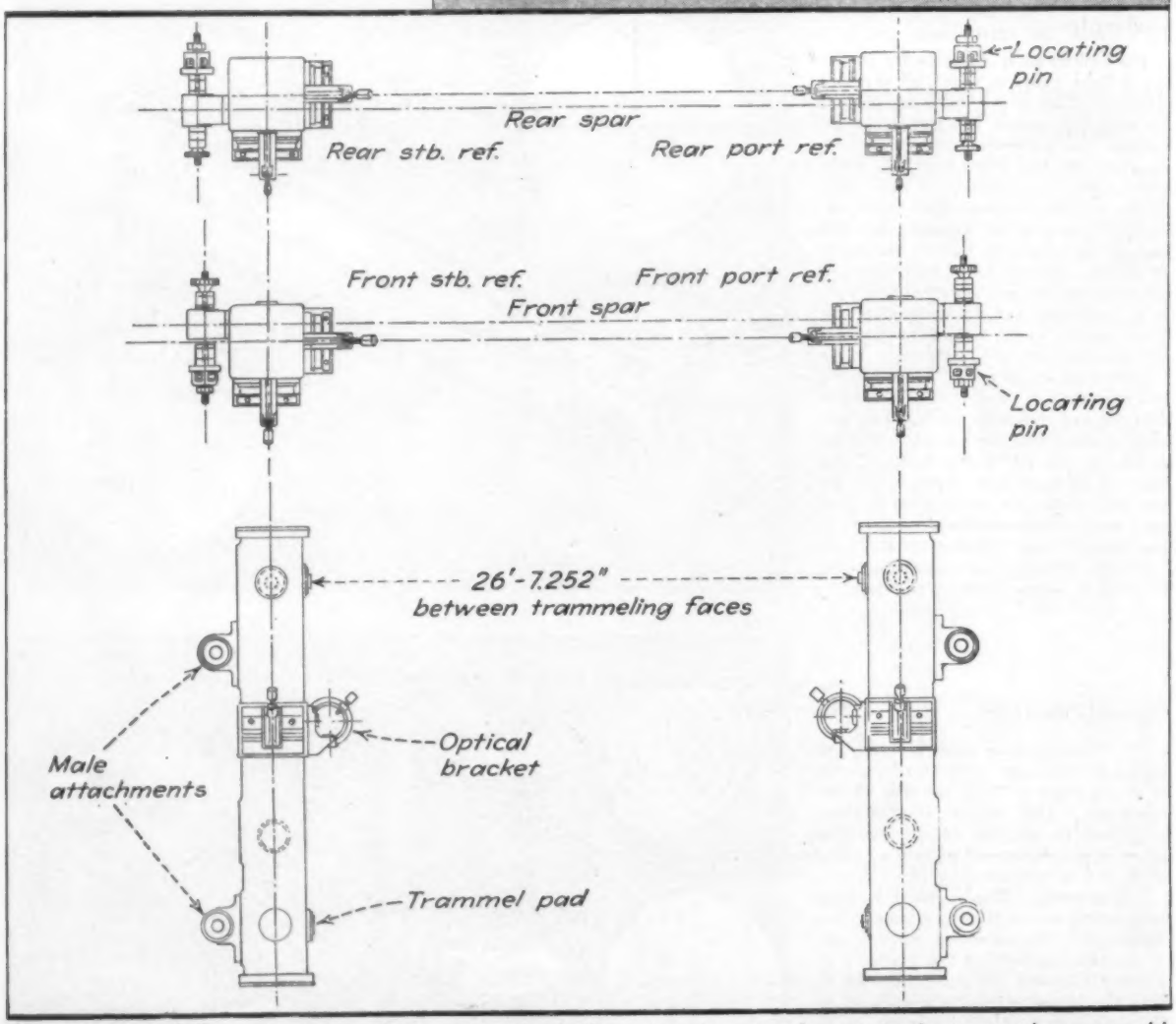
Tilt. If the pick-up point is tilted, the image of the rear collimator graticule is at an angle W with the axis of the telescope. The image is therefore projected to position M on the telescope graticule instead of to the center at T. Tilt is measured by N.

Displacement. Displacement is read by focusing on the front graticule in the collimator. The extended optical axis of the telescope strikes the graticule at point H instead of at the center E. Thus the image of center E appears at N instead of T on the telescope graticule. What the operator sees in the telescope is shown in the two diagrams at left, but in each case the images are displaced in two meridians, not one as diagrammed.



Bolt holes in the centerplane attachment points for the outerwing must be optically referenced because hole A must not lie more than 0.001 in. to the left of the centerline (see sketch at right) and hole B not more than 0.001 in. to the right of the centerline. Similar specifications apply to holes C and D. Axes of these four holes must lie in a plane parallel to the plane containing the attachment-hole axes at the other end of the jig—30 ft. away





Arrangement of the optical jig references to check the outer-wing attachments in the centerplane assembly jig follows inspection practice laid down by the Ministry of Aircraft Production. Alignment telescopes and collimators are mounted in the V-ways of the jig references to measure tilt and displacement of the attachment points. Sectionalized Johannson type inside micrometers check linear dimensions

quently of cast iron to avoid damage. The castings are machined for pick-up fittings, and for leveling and measuring surfaces that are located as closely as the gage maker can work, in contrast to the aforementioned gages which are commonly made to one-tenth the tolerance allowed on the working drawing.

Jig references have these advantages:

(*a*) Assembly jigs in which pick-up points and locating surfaces are accurately set to the jig reference produce components that assemble without fitting. For example, fin-attachment holes in the front and rear spars of the tailplane are jig-referenced. Corresponding attachment holes in the fins are referenced with counterparts of the tailplane-spar jig reference. The holes in the two parts are reamed in their respective assembly jigs, but close-fitting bolts will assemble the two components without further fitting operations.

(*b*) The jig reference for a part can be set and checked with the jig reference of the counterpart, something that is impossible with the gages for the two parts.

3. *Optical jig references.* For setting up and periodic checking of large assembly jigs in which utmost precision is required at widely separated attachment points (components such as the center plane and the outer wings) optical jig references have been brought to a high state of development in England. Furthermore they are now being made in Canada.

Optical reference equipment consists of: (1) optical alignment apparatus developed by Taylor, Taylor & Hobson, Ltd., Leicester, England, (2) ultra-precision jig references that attach to the jig pick-ups, or attachment points, and which mount the alignment telescope and collimator, and (3) English-type Johannson micrometer trammels, or sectionalized inside micrometers.

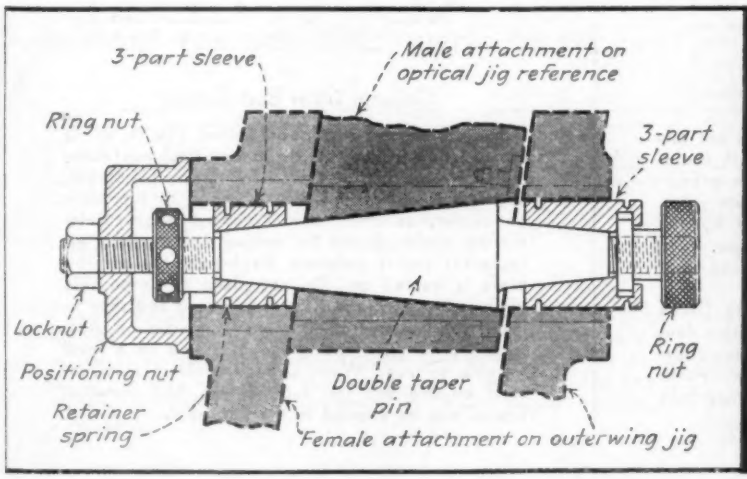
Optical jig references will detect misalignment of 0.010 in. at 50 ft., lack of parallelism within six seconds of arc (one part in 30,000). The mounting brackets of the references incorporate trammel pads that are held to a total tolerance of 0.0002 in. with respect to the axis of the attachment holes fitting the pick-ups in the jig. With the micrometer trammels, it is possible to measure within 0.005 in. between trammel pads spaced 30 ft. apart; to within 0.0002 in. in a distance of 5 ft.

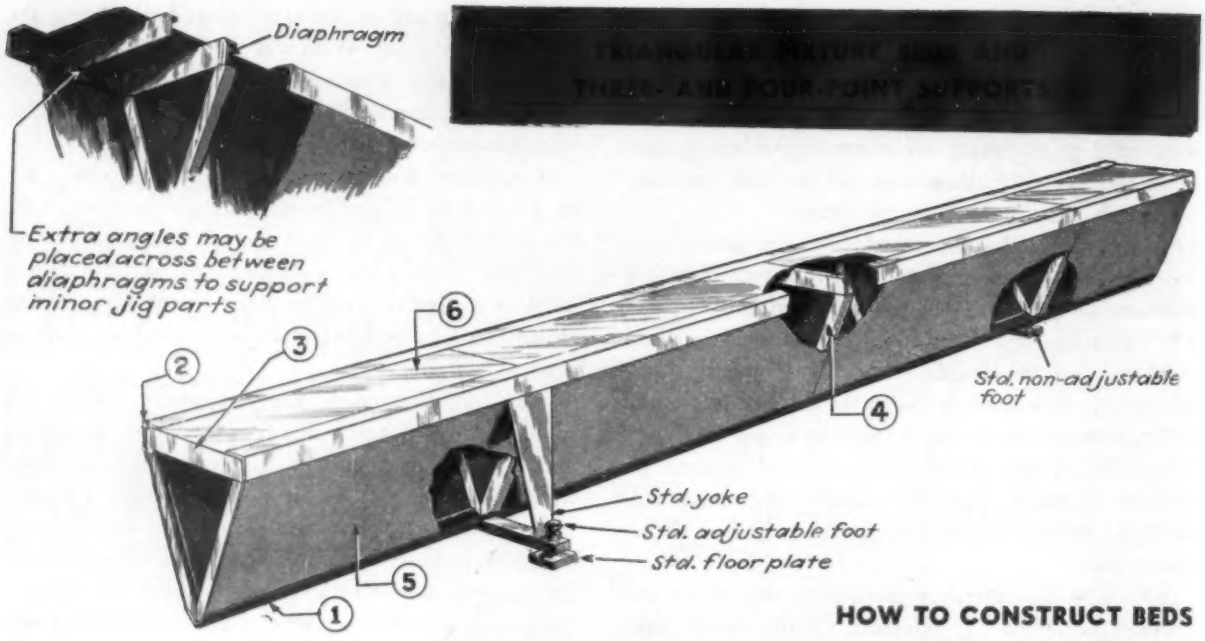
A complete checkup of the pick-up points in a 30-ft. outer wing jig can be made in approximately two hours. In addition to speed and accuracy, optical referencing permits the equipment to be left largely in place if repairs must be made to the jig, and the entire task can be handled in one eight-hour shift as a usual thing.

4. *Gages that check the component.* These are used for small parts and subassemblies possessing sufficiently wide tolerance. Lightness with adequate rigidity are necessary features of such gages. Tubular-steel framework is commonly employed for the gage structure in order to achieve rigidity. Cast-iron brackets support non-adjustable locating pads or bushing plates. If deflection or wear occurs, the gaging elements must be remachined—no shimming is permitted. Weight permitting, gages for parts and assemblies under 15 ft. long are taken to the component, otherwise, the part is taken to the gage.

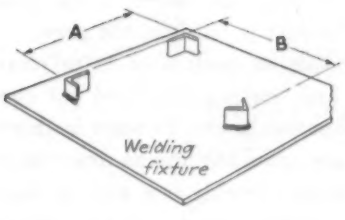
5. *Approved jig-produced parts used as substandards or patterns.* These are not employed for components possessing close tolerances. In some instances, rejected dural parts are reworked into an interchangeability setting fixture for assembly jigs, and the dural structure is considered better than a steel sub-standard because the coefficient of expansion is the same as the work. For example, a dummy leading edge was reworked from scrap material, being stiffened transversely with steel plates and bars and longitudinally with heavy dural channels. The dummy is used to set outer-wing leading edge assembly fixtures to obtain a uniform relation between engine cowling attachment points and the front spar.

The principles and operation of the optical alignment apparatus are given in an accompanying illustration. Both the telescope and the collimator are hardened steel tubes that can be clamped without





HOW TO CONSTRUCT BEDS



(a) Make fixture at left by welding stubs of keel angle (1) and of side angles (2) to plate.

(b) Fit and weld diaphragms from (3) and (4) angles.

(c) Invert side angles (2) and weld on diaphragms, measuring to flat faces of latter. Weld on (1). All welding symbols are American Welding Society Standards.

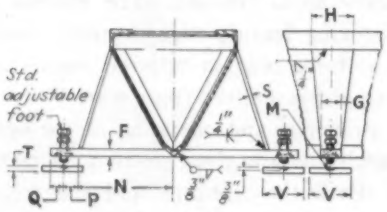
(d) Apply side plates (5), which may be spliced over diaphragm. Use intermittent welds. Start welds at center, work out both ways along both sides.

(e) Intermittent-weld inside, to create tension in plates, compression in keel and side angles. This increases rigidity.

(f) Level bed top with transit or level and support at four points. (Twist cannot be pulled out later).

(g) Punch or burn 1-in. holes on 4-in. centers in deck plates for diaphragms. Weld to side angles and diaphragms, starting at center and working outward so welding is symmetrical about both center lines.

ARRANGEMENT OF SUPPORT YOKE



Yoke Type	G	M	P	Q	S	T	V	F
Light	3	½	2½	2	½	¾	5	1½
Heavy	4	¾	3	2½	¾	1	8	2

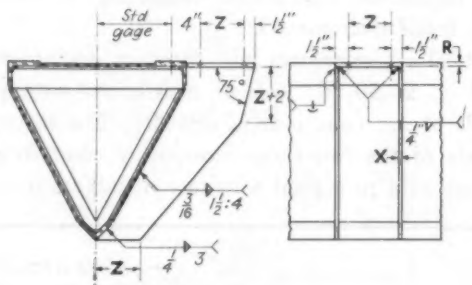
General: When deflection analysis does not rule otherwise, use a three-point suspension with standard non-adjustable foot and yoke. When a four-point suspension is required, use two of these yokes.

Choice of yoke and foot: Governed by the maximum load on any screw. Use light type up to 2500-lb.-per-screw load, heavy type above this. Use same type throughout any fixture.

Lateral location: Dimensions H and N (large table) are governed by bed type and relative danger of overturning. For high or unbalanced fixtures use the higher value for N. For low fixtures such as drill jigs or checking tables, N may take the lower value.

ATTACHMENT POINTS

Column Braced at Sides



Column Over Bed Center

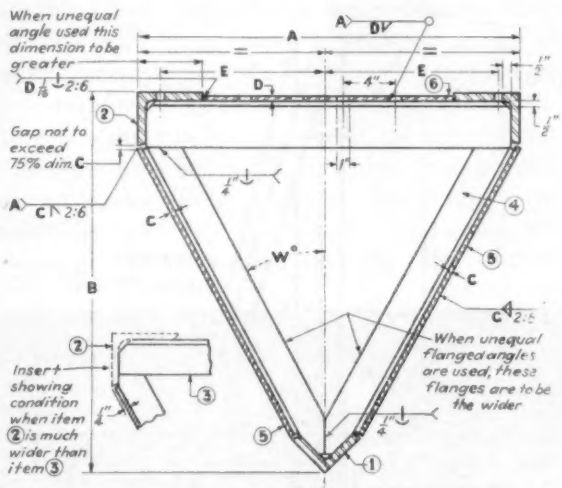
Heavy columns should be bolted (⅝ in. or ¾ in.) on gage E (see table). Space attachment holes in lengthwise multiples of 4 in. if possible. Lighter columns and fittings are attached to top plate on centerlines other than standard gage. Reinforcing angles should be welded across under attachment points between diaphragms before top plate is welded on. Do not plane or shape side angles (2). Spotface 3 in. dia. instead and shim to level with circular plane shims. Or weld on steel pads ⅝ in. thick and plane or shape to a level working surface. When a heavy column must extend beyond the top face of the bed, external braces may be applied to the bed as shown above.

distortion in V-blocks of the optical jig references. Optical jig references are of two types: (1) box-section light-alloy castings (as in the case of the center plane equipment) to which the V-block brackets and male-attachment brackets or pick-ups are assembled, or (2) a seamless-steel tube upon which similar brackets are pinned. Both kinds of jig references must be light in weight, but the latter has the advantage that the brackets can incorporate compound angles (as in the case of the outerwing jig attachment points) so that only one sight need be made between two distant attachment points having a compound-angular relationship.

The greatest of care is required in making optical jig references. V-blocks for the telescope and collimator have a limit for misalignment of 0.0005 in. in 24 in. The axis of holes in the male attachments must be perfectly parallel and in the same plane (for a center plane reference). Taper holes are used in the male attachments. The clamping face at the small end of the bore must be perfectly at right angles in two planes to the hole axis, and in the same plane with the other attachment clamping face to within 0.0005 in. in 24 in.

A special mounting pin is used to fasten each of the two male attachment points of the jig reference to the female attachment points built into the jig. These pins possess a double taper cone. The long taper seats in the male attachment hole, and its protruding tip is aligned in one fork of the female attachment by means of an expansible sleeve, or three-part collet. The short taper is similarly aligned in the other fork of the female attachment. Ring nuts at both ends of the pin seat the collets in the female attachment, and a large cap nut draws the clamping face of the male attachment snugly against the female attachment.

The use of optical jig references and the reasons for their application can be explained in relation to the centerplane assembly jig. The centerplane consists principally of front and rear spars fastened across the front and rear of the fuselage intermediate center section. The spars have been predrilled on drill-referenced jigs before installation in the centerplane assembly jig. All riveting operations on the centerplane are carried out, and the structure is released so that any distortion will be relieved before final reaming of the outerwing attachment holes in the ends of the front and rear spars. It is essential that these holes after reaming shall come within very close limits; that

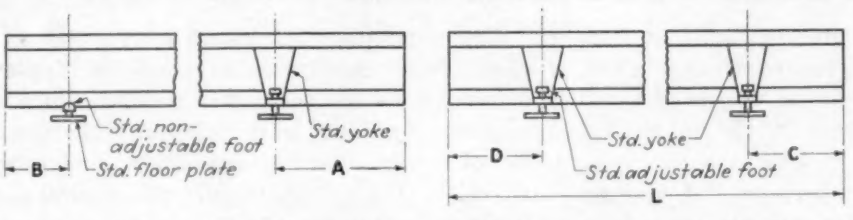

When unequal angle used this dimension to be greater
Gap not to exceed 75% dim. C
Insert showing condition when item ② is much wider than item ③
When unequal flanged angles are used, these flanges are to be the wider
4"

STANDARD DIMENSIONS AND SECTIONS

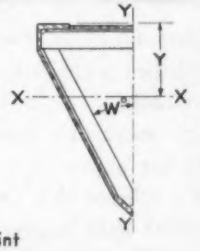
Bed Type	A	B	E	Item ① (H.R.S. Angle)	Item ② (H.R.S. Angle)	Item ③ (H.R.S. Angle)	Item ④ (H.R.S. Angle)	Item ⑤ Thickness C	Item ⑥ Thickness D	Angle W°	Between Diaphragms	Support H	Support N	Attachment Points X	Attachment Points R	Attachment Points Z	Y	Mom. Inertia I_{xx} in in.^{4}	K in in.^{4}	Wt. per ft. inc. Diaphragms
1	52	36	24	5x5x3/4	6x6x3/4	4x3x1/4	3x3x1/4	1/4	1/4	40.5	40	10	29/34	5/8	1	4,6,8,12	11.8	8300	8000	195 lb.
2	42	32	19	5x5x3/4	5x5x3/4	4x3x1/4	3x3x1/4	3/16	1/4	36	32	10	24/29	1/2	3/4	4,6,8	10.5	5500	4100	155 lb.
3	36	32	16	4x4x5/8	4x4x5/8	3x3x1/4	3x3x1/4	3/16	1/4	31	32	10	20/24	1/2	3/4	4,6,8	10.6	4300	3100	125 lb.
4	28	26	12	4x4x5/8	4x4x5/8	3x2x1/4	3x2x1/4	3/16	3/16	30	32	8	16/22	3/8	5/8	4,6,8	9.2	2300	1600	100 lb.
5	24	24	10	3x3x1/2	4x3x3/8	3x2x1/4	2x2x1/4	1/8	3/16	21	24	8	14/20	3/8	5/8	4,6,8	8.35	1300	800	65 lb.

Any of items ① ② ③ and ④ may be heavier sections if indicated section is not available

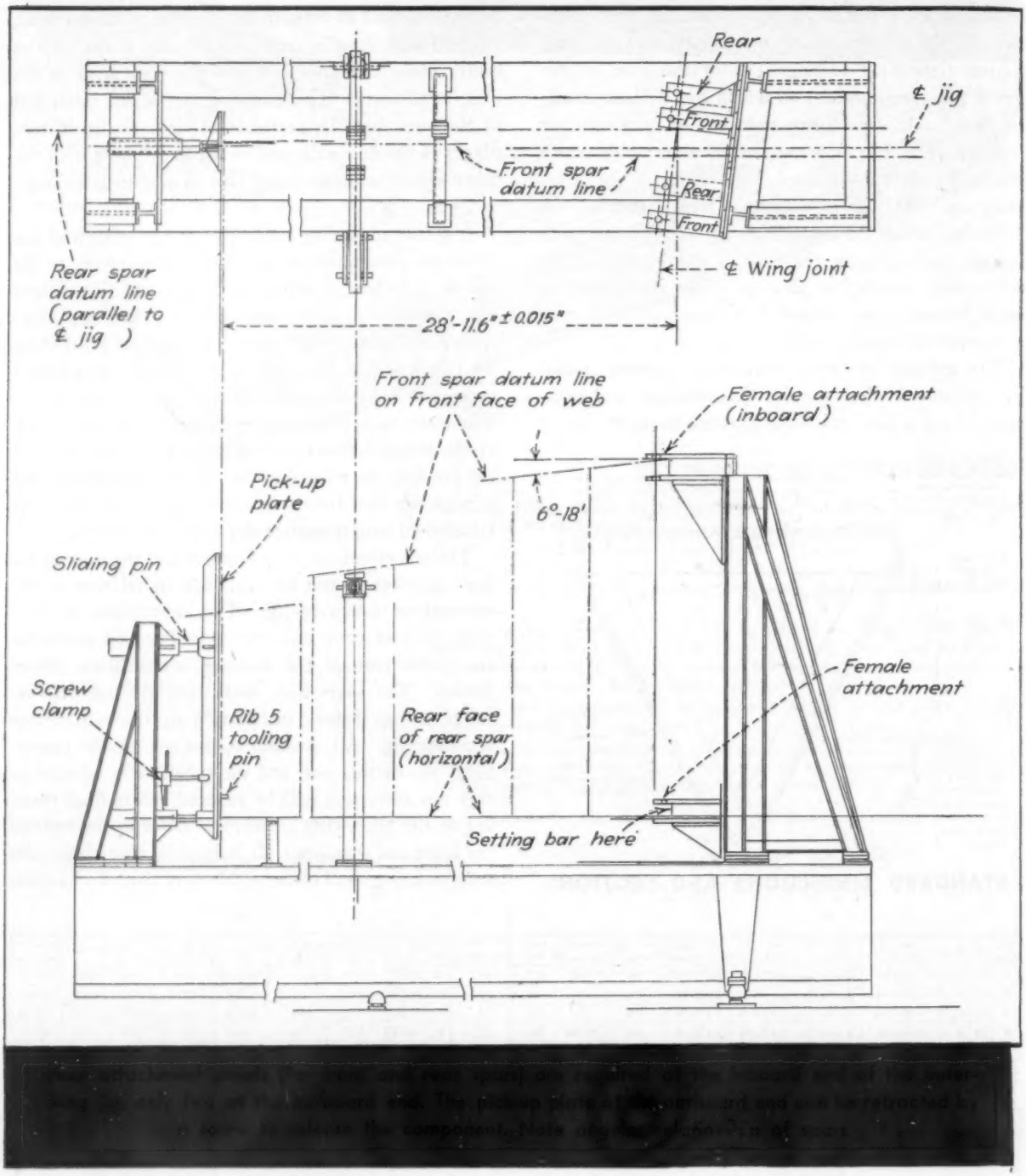
SUPPORT POSITION LENGTHWISE OF BED



MATHEMATICAL PROPERTIES



When a fixture is uniformly loaded (no heavy end columns) A=L/4 and B=L/8 for a three-point support. C=D—L/5 for a four-point support. When half load is at one end and less than a quarter at the other, place three-point support yoke at first end with A=L/10 and D=L/8. If a four-point support is used with C at the heavily loaded end, C=L/10 and D=L/4. Point of support can be moved L/16 either way to get even diaphragm spacing, because bed is rigid enough to permit this in all cass.



is, they must not deviate more than 0.001 in. from established centerlines. This requirement must be met, even though the holes fall at the corners of a rectangle measuring approximately 26×90 in., and the spars are approximately 30 ft. long.

To achieve this degree of accuracy, the bushings for final hand reaming of the spar attachment holes must be referenced by the optical method. Accordingly, an optical reference is installed at each corner of the jig, being mounted on the female attachments by the special pins described. The sequence of checking the jig is as follows:

1. One reference, say that at the port side of the front spar, is selected as a datum. A telescope is mounted in the V-block so that it can be sighted upon a collimator mounted on the reference at the starboard end of the jig. Tilt and displacement measurements are made. The distance between the trammel pads is checked with Johannson inside micrometers supported on wood stands. If the attachment points show tilt or displacement outside allowable limits, they are removed and remachined until satisfactory. No adjustment is provided in the mounting of female attachments (which are actually jig references in them-

selves), because it is felt that riveting vibration might disturb the settings.

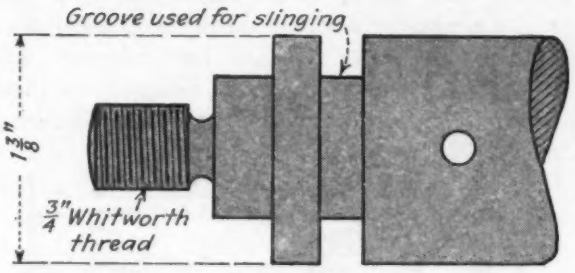
When the jig is originally set up, the collimator readings must be zero. At periodic checks, say one month apart, it is permissible to have deviations within allowable tolerances.

2. If the starboard front spar reference checks satisfactorily, the collimator is moved to the starboard rear spar, and the telescope is advanced to the second reference. Tilt and displacement readings are made, the distance between references is trammeled and any necessary corrections are made.

3. When the complete round of the rectangle has been made, the procedure is reversed for a double check.

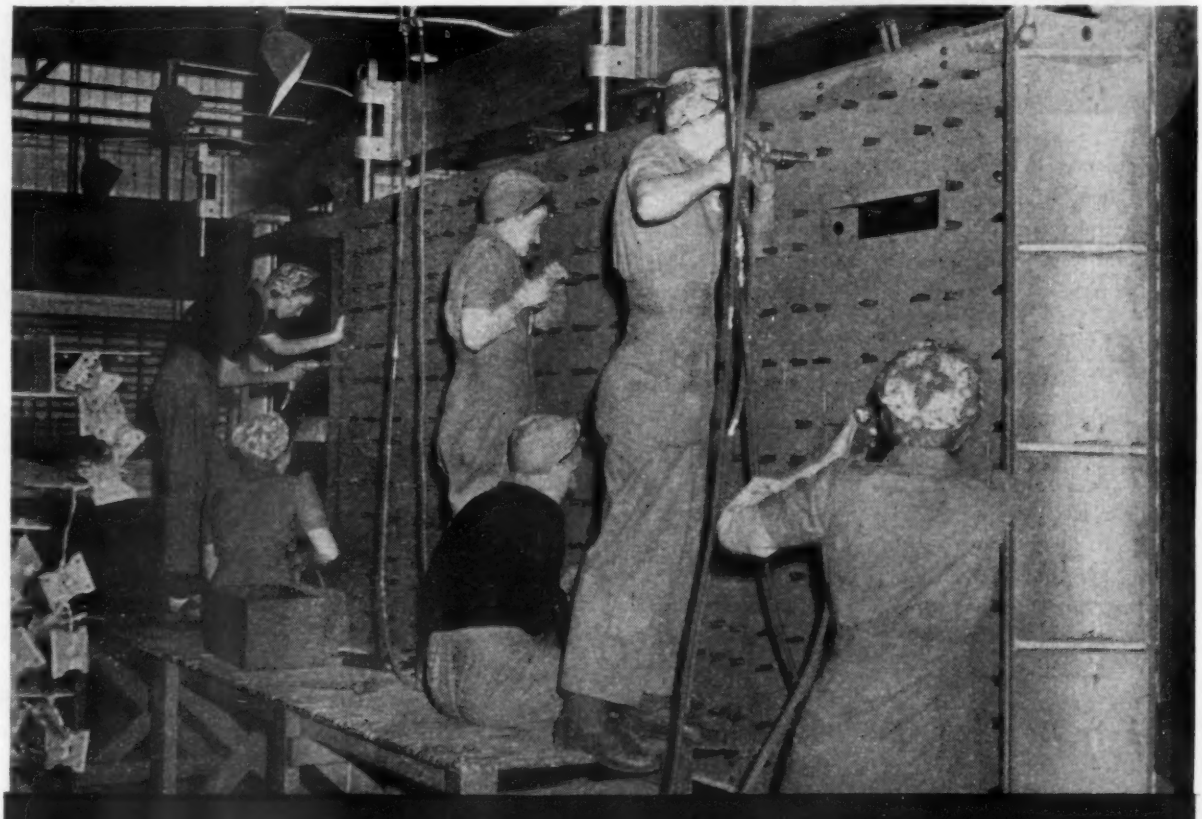
Optical referencing of the outer wing jig presents a different problem, namely, coping with angular relationships of the attachment points. There are four attachment holes at the inboard end of the outer wing, and these must be produced to the same accuracy as the attachment holes at the mating end of the centerplane, because a snug push fit of the bolts is required. Moreover, the attachment holes at the inboard end of the outer wing must lie at the correct incidence and dihedral angles. These angles are established when the holes are predrilled in drill-referenced jigs, but the holes must be hand reamed after the outer wing is completely fabricated and the clamping pressure is released.

STANDARD JIGGING PLUG



This standardized jigging plug maintains interchangeability by locating the longerons in the floor assembly jig, then locating the floor section in the fuselage assembly jig, and finally in the case of the centerplane jig by locating the fuselage intermediate center section

Three optical jig references are required for the starboard outer wing jig, three others for the port jig. Principle of application is the same in both cases. One reference is mounted vertically at the outboard end of the jig, two are placed horizontally at the inboard end, one at the top and the other at the bottom. Jig references are of tubular steel construction for



convenience in embodying angular relationships in the optical brackets. Thus the compound angle between the front outer wing spar and the joint plane for the outer wing to center section wing is incorporated in the jig reference for the front spar, inboard end.

After the first component is produced from assembly jigs for centerplanes, outer wings, and aileron hinges and their brackets in the detachable trailing edge, the optical reference equipment is applied for a check. Then at increasing intervals it is again applied. Records of jigs are kept, and at convenient intervals (when one is free) they are again checked after having been in production for say a month. In no case, however, has a jig required relocation of the pick-ups or interchangeability points by more than 0.001 in., although deflections in the axis of collimation as great as 0.020 in. in 30 ft. have occurred, largely because of cold air currents or sunrays striking one part of the jig. Bright aluminum paint is used on jigs to reflect heat.

The stability of these jigs, and scores of others used in the Victory plants for assembly and welding purposes, is derived from their inherent rigidity. All sections have been calculated for stiffness. The jig as a whole deflects a known amount under load, and is not affected in the many instances of three-point support by floor settlement.

Torsional rigidity is attained by tubular or inverted triangular-section beds of welded design.

Standards have been set up for fixture components, to make it easy for the jig designer to select economical sections with sufficient flexural and torsional moments of inertia. In some instances box-section beds, internally braced are employed. But it should be noted that in all cases, completely closed sections are used.

The flexural moment of inertia I is computed in the customary manner. Calculation of torsional rigidity is another matter. Here are the symbols and equations used by Victory engineers:

K = effective moment of torsional inertia in inches to the fourth power, and is therefore comparable dimensionally with I

M = torsional moment applied in in.-lb.

G = modulus of rigidity, which is taken as 12×10^6 lb. per sq. in. for mild steel

θ = angle of twist per unit length, in radians per inch of length

Then:

$$K = \frac{M}{G\theta}$$

For round bars and tubes, $K = J$ = the polar moment of inertia.

For all other sections, K is less than J. In a thin-walled equilateral triangle, for example, of side L and unit thickness, the equations are:

$$K = \frac{L^3}{4} \text{ and } J = \frac{L^3}{2}$$

In a thin-walled square of side L, the equations are:

$$K = L^3 \text{ and } J = \frac{4L^3}{3}$$

The general equation for K in any thin-walled closed section is:

$$K = \frac{4A^2}{\int \frac{ds}{T}}$$

Where A is the area enclosed by the centerline of the shell, s is the length of the shell centerline and T is the shell thickness.

For the triangular bed sections standardized by Victory Aircraft, the values of effective moment of torsional inertia, K, range from 800 to 8000 in.^{4}

In designing Victory jigs, special attention was paid to accessibility and ease of unloading. All assembly floors are served by overhead cranes. Therefore, after release from their jigs, components are either lifted directly upward, or upward and at a

slight angle, by means of wire-rope slings. Only a few clamps or jig elements need be removed when unloading a jig. And these are located at the tops and at the ends of the jig (usually one end only) so that maximum accessibility is provided to riveting operators. Further details of accessibility features will be discussed with relation to specific jigs.

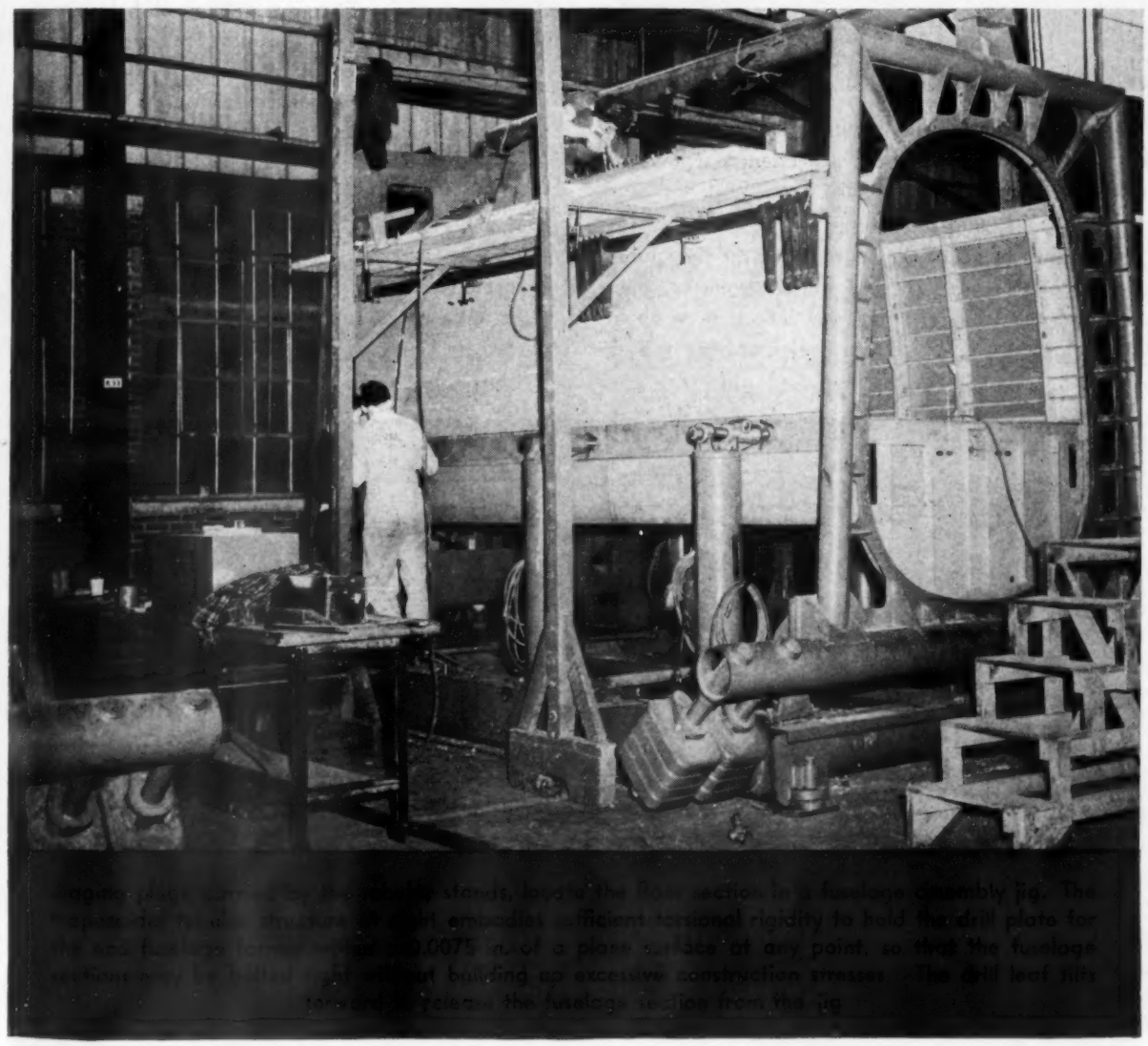
Structural rigidity and accessibility are worthless features if jigs will not produce interchangeable components. Therefore Victory engineers make allowances for changes in shop temperature, in order that jigs will always produce parts of uniform size as well as uniform shape. Differential expansion of a 30-ft. dural spar in a steel jig amounts to 0.046 in. for a temperature change of 20 F. If a dural spar drilled at 60 F. in a steel jig fits exactly in a given wing, another spar drilled at 80 F. will not fit. For this reason dural spars over 10 ft. long are drilled in dural jigs fitted with hardened steel bushings. One end of the drill plate is fixed and the other end is free to float on steel ways in the jig bed. When the dural spar is taken to the assembly jig, one end is picked up by a fixed location point (usually at the inboard end) and at other locations by floating points guided in ways on the bed of the jig. Furthermore, attachment points at the end of a component such as the centerplane and the outer wing are not reamed until the assembly is completed and the clamping pressure is removed. Hence any stresses in the structure produced by riveting may be largely removed before final machining of the interchangeability points.

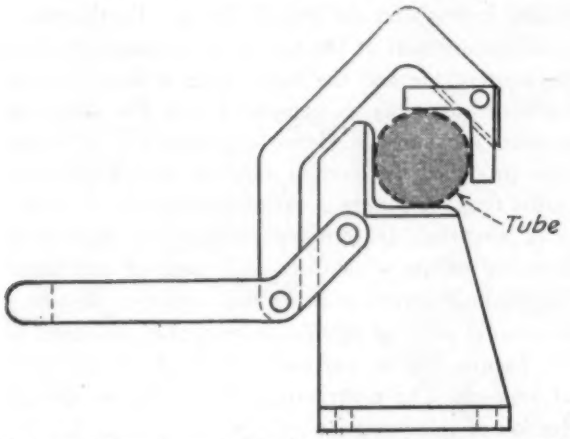
A simplified deflection analysis of an outer-wing assembly fixture with three-point support and single longitudinal torque-resisting bed follows: Assume a horizontal force of 100 lb. to be applied to a part of the fixture 100 in. vertically above the single point of support. The contribution of the bed to the deflection of this point is:

$\frac{FLD^2}{GK}$, wherein:

F = force, here 100 lb.

L = length of bed between single and paired support





Victory Aircraft engineers have standardized on this type of toggle clamp for holding tubular aircraft components in welding jigs

D = height of application of force above single point of support, here 100 in.

G = modulus of rigidity, which is taken as 12×10^6 for mild steel.

K = effective moment of torsional inertia, with the value 4100 inches to the fourth for the jig considered

If the bed is of Type 2 with a length L between supports of 360 in., then the deflection Δ will be:

$$\Delta = \frac{100 \times 360 \times 10{,}000}{12{,}000{,}000 \times 4100} = 0.0073 \text{ in.}$$

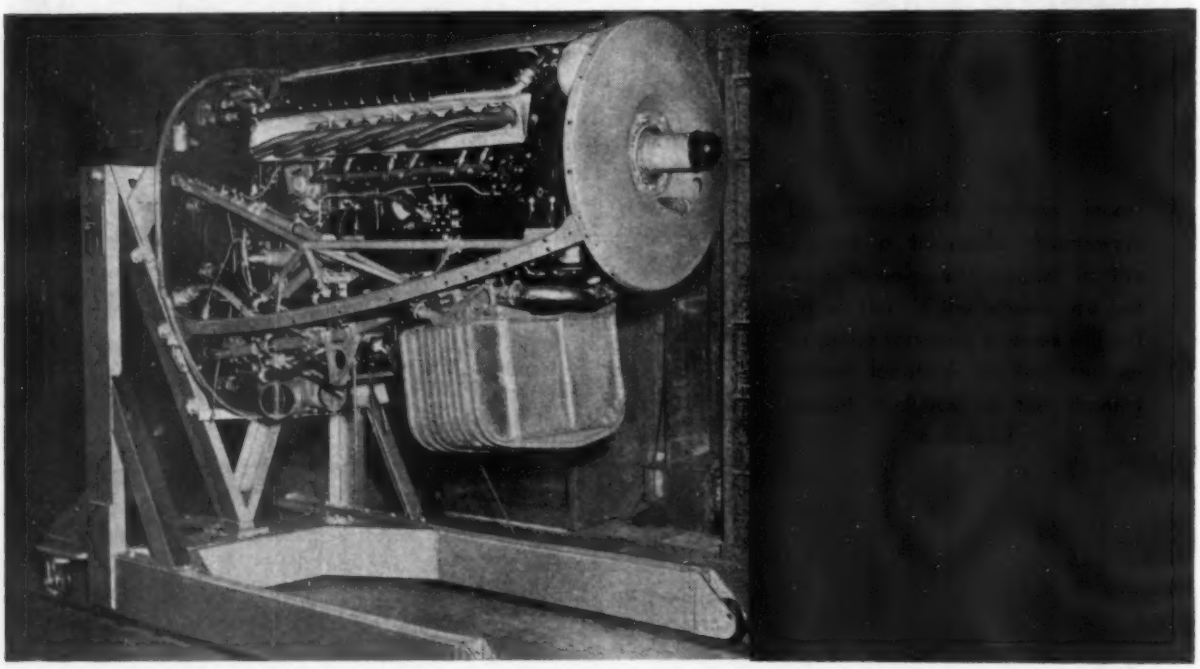
To this must be added the deflection of the jig column and brackets between the bed and the point of application of the load, bringing the deflection to about 0.010 in., which is the deflection designed for in a jig producing a large interchangeable component with close tolerances. This corresponds in the outer wing jig to a deflection in incidence between inboard and outboard ends of the section built in this jig of 21 seconds of arc in 30 feet.

The 100 lb. load is arbitrary, but corresponds roughly to the pressure applied by the maximum number of fitters and riveters likely to be working from one side only.

The outboard and inboard cantilevers are composed of heavy structural steel cantilevers screwed and doweled to the bed. The inboard column carries stationary spar attachment pickups. Outboard pickup pins for Rib 5 are embodied on the face of a plate that can be moved longitudinally on sliding shafts engaging bushings in the outboard cantilever. Movement of the outboard pickup plate is effected with a screw, to release the assembly.

Spars are picked up by fixed location points at the inboard end, to accomodate differential thermal expansion. Pickup pins at the inboard end are 1/32 in. undersize, to suit undersize attachment holes in the two spars, which allow reaming to size after assembling the wing section. Reaming is done with an "old man," using a hardened lead-screw to feed an end-cutting tool. The last 0.0015 in. on the diameter is removed by honing.

On final assembly and rigging of the aircraft, a tubular steel vertical hoist gantry is very useful. The outer wing may be steadied, using a contour board supported between two gantries. The twisting effect of the outboard power unit on the outer wing may be relieved by slinging the propeller shaft from the



gantry when fitting or replacing a gasoline tank. The base of the crane is an H-frame of tubing, with casters and steadying jacks. A novel feature is the fine adjustment. The rachet and pawl on the drum permit the block to be locked at intervals of about 2 in. in height. Any fraction within this interval can be adjusted by the jackscrew at the foot of the boom, which carries an internal pipe keyed to prevent rotation.

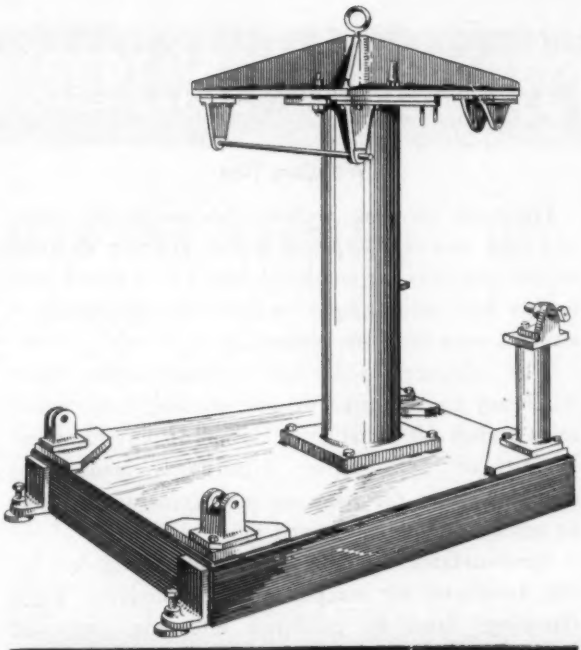
Backbone of the Lancaster is the floor which supports the bomb load. Since the fuselage is cut into five sections by transverse planes, the floor is likewise made in sections, and these embody interchangeability points in each side longeron. Extrusions of π section are used for the longerons, and these are connected by crossbeams. Flanged intercostals running longitudinally join the crossbeams, so that the result is a grid-like construction.

Vertical floor jigs are rectangular in shape. Each side of the rectangle is a box section consisting of two 8-in. channels joined by two 3/8-in. plates 12 in. wide. In welding box sections and other closed constructions, 2-in. welds are made with 3-in. space between. The bead is nominally 1/4 in.

Victory uses a jigging plug to attain interchangeabilty in manufacture of the front and rear center-sections. Three of these plugs are used to locate the longeron extrusions at top rail and bed of the floor-section assembly jigs. Later when a completed floor section is placed horizontally in either the front or rear center-section jigs, the jigging plugs are used to locate the component. For this purpose the fuselage section jig has tubular columns placed on each side. A bracket with guide bushings for a hollow sliding pin is fastened on top of each column and the floor axis is referenced. The floor section with jigging plugs in place is lifted by a wire rope sling with hooks engaging grooves in four of the plugs, and is transported to the fuselage jig. When the floor is lowered to the proper position, the hollow pins are slid over the ends of the jigging plugs and secured with keepers. When the fuselage is assembled, the hollow pins are retracted and the plugs are used first by the transfer sling and then by the trolley which supports the component in its installation stage and for final mating.

Front and rear center-section jigs have a box section rectangular base. Here a three-point support is impractical. Hence a jack and leveling pad are applied at each corner of the base. For ready accessibility one vertical end frame (incorporating a drill plate for the end former or frame) is fixed, but the other is counterweighted, and swung down and away from the assembly by hand pressure. Thus a straight upward lift removes the fuselage section.

The counterweighted end frame carries a drill plate measuring approximately 6×8 ft., and this plate must be maintained true within ±0.0075 in. in relation to a plane surface. To resist torsional



moments, the end frame is a trapezoidal shape composed of commercial pipe and hot-rolled steel plate.

Engine Assembly

The engine mount, Rolls-Royce engine, accessories, piping, electrical harness and cowling are assembled as a unit upon a cantilever trolley jig, ready for assemoly into the plane. The trolley consists of a box-section H-frame bed (a type of bed favored by Victory engineers for a number of purposes). A grooved caster is provided at each corner of the bed so that the trolley can run on rails at the assembly line, and then be rolled over the concrete floor to either storage or a waiting plane.

A channel-section vertical cantilever is welded and braced to each side of the bed, near one end. Between these cantilevers is placed a triangular-shaped channel frame that supports a dummy bulkhead. The triangular frame is provided with three-point support, at the bottom by a pin fitted to the bed, and at the top (both sides) by pins loosely engaging slots in the cantilevers. Thus when the casters are moved out of plane by floor irregularities, torsional moments are not imposed on the triangular frame supporting the dummy bulkhead.

This is an important feature because the dummy bulkhead carries four pick-up points for the engine-mount attachments, and these must be held to ±0.002 in. for location. The bulkhead is also fitted with steel dummies held to ±1/32 in. for all couplings and un-

ions, and with Dzus cowling attachment points held to ±1/64 in.

Welding Jigs

Generally speaking, welding jigs are of two types: (1) the roll-over type in which tubular or box-section members are employed, and (2) a closed box-section bed supporting a vertical member which is either a tube or a box-section.

The roll-over jig derives torsional rigidity from the heavy central pipe or box section, from which pipes branch out to carry the clamps or plug locations. Rigidity of the structure is purposely made great enough so that the indexing arrangement need only be applied to one end of the jig.

Steel-surfaced assembly and welding jigs are being developed for components like fairings. Eight stampings must be combined into one particular fairing. The problem is to locate and hold the pieces correctly while welding them together and to scribe the trim lines at the proper inner and outer contours. The assembly jig is actually a master pattern incorporating locating points, clamps, scribing surfaces and means to hold drill plates while drilling rivet holes through reinforcing strips and the skin assembly. A steel surface is required on the jig because of welding heat.

The jig has a box-section base, in which the top surface is the datum. Steel former plates, or templets, representing cross-sections of the fuselage, are welded vertically to the jig base at 6 in. centers. Their outlines are 1/8 in. undersize to accommodate the 1/8 in. black-iron plate that is cold formed to fit them. The steel surface plate is welded through 3/8-in. holes to the formers, at 4-in. intervals.

The eight stampings are trimmed for the weld lines, laid in the jig, clamped and welded. Inner and outer trim-line templets are applied to reference points in the jig and their outline is scribed on the skin. Then the fairing is removed and trimmed. It is replaced in the jig for two purposes: (1) partial beading of the inner edge, and (2) application of reinforcing strips and drill plates at the outer edge for purposes of drilling the rivet holes, or marking locations for spot welding. Riveting of the reinforcements and finish beading of the inner edge are done outside the jig. The device paid for itself in the production of only a few fairings.

Circular Forming Tool Blanks and Mounting—III

CERTAIN CHANGES in tolerance and the addition of associated mounting or clamping elements for holders used on automatic and other screw machines appear in the revised American Standard ASA B5.7-1943 on circular and dovetailed forming tool blanks. To establish a minimum number of blanks, machines of comparable stock capacities have been classified into six groups for reference purposes. Each group of machines takes a definite size of tool and the holders are provided with suitable mounting or clamping devices. Information on circular forming tool blanks and associate mounting or clamping elements for machine groups 1, 2 and 3 have appeared in a previous number. Similar data for circular forming tool blanks for machine groups 4, 5 and 6 are found herewith. Dovetail forming tool blanks will be discussed soon.

Circular forming tool blanks for machine groups 4, 5 and 6 have a counterbored mounting hole and six adjusting holes on one side. A center bolt and hook bolt are generally provided for clamping the tool in the holder. Positive means are incorporated in holders for machine groups 4, 5 and 6 to adjust the circular form tool to the center of the work. Circular motion is transmitted to the cutter to raise and lower the cutting edge, by a plate with a pin that engages one of the six adjusting holes. This motion is transmitted to the mounting plate by a screw. Details of the arrangement are shown in the illustration with Table 7.

Table 1 Machine Classification

Group Number	Type of Machine	Maximum Capacity*
4	1 5/8 Gridley	1 5/8
	1 5/8 Acme Gridley	1 5/8
	No. 206 New Britain	1 5/8
	No. 415 New Britain	1 5/8
	No. 410 New Britain	
	1 3/4 Gridley	1 3/4
	1 3/4 Greenlee	1 3/4
	No. 4 Brown & Sharpe	1 7/8
	2 Greenlee	2
	2 Gridley	2
	2 Cleveland	2 1/2
	2 × 2 3/4 Cleveland	3 1/4
	2 1/4 Cleveland	2 1/2
	2 1/4 × 2 3/4 Cleveland	3 1/4
	2 1/4 Gridley	2 1/4
	2 1/4 Greenlee	2
5	No. 6 Brown & Sharpe	2 3/8
	No. 208 New Britain	2 1/2
	No. 425 New Britain	2 1/2
	2 5/8 Gridley	2 5/8
	2 3/4 × 3 3/4 Cleveland	3 1/4
	2 3/4 × 4 Cleveland	2 3/4
	3 Gridley	3
	3 5/16 Gridley	3 5/16
6	3 1/4 Gridley	3 1/4
	3 1/2 Gridley	3 1/2
	4 Gridley	4
	4 Cleveland	4
	4 1/4 Cleveland	4 1/2
	4 1/4 Cleveland	4 1/4
	4 1/4 Gridley	4 1/4
	4 1/2 Gridley	4 1/2
	5 Gridley	5
	5 1/2 Cleveland	5 1/2
	6 3/4 Cleveland	6 3/4
	7 3/4 Cleveland	7 3/4

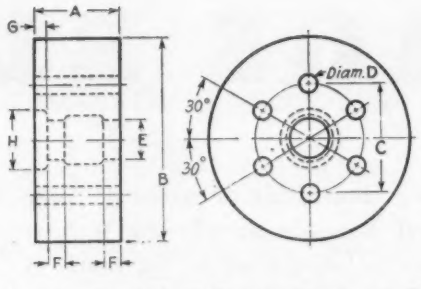


Table 3 Dimensions for Finished Blanks for Circular Forming Tools With Counterbored Mounting Hole

Group Number	Basic Blank Size[1,2] B × A	Diameter B Max	Diameter B Min	Width A Max	Width A Min	Adjusting Holes[3] C[4]	Adjusting Holes[3] D[4]	Mounting Hole Diameter E[6]	Mounting Hole Bearing Surface F	Counterbore Diameter H[7]	Counterbore Depth G
4	3 1/2 × 1/2	3 17/32	3 33/64	17/32	33/64	1 7/8	1/4	3/4	...	1 1/32	3/16
	3 1/2 × 3/4	3 17/32	3 33/64	25/32	49/64	1 7/8	1/4	3/4	...	1 1/32	3/16
	3 1/2 × 1	3 17/32	3 33/64	1 1/32	1 1/64	1 7/8	1/4	3/4	...	1 1/32	7/16
	3 1/2 × 1 1/2	3 17/32	3 33/64	1 17/32	1 33/64	1 7/8	1/4	3/4	5/16	1 1/32	1/4
	3 1/2 × 2	3 17/32	3 33/64	2 1/32	2 1/64	1 7/8	1/4	3/4	5/16	1 1/32	3/4
	3 1/2 × 2 1/2	3 17/32	3 33/64	2 17/32	2 33/64	1 7/8	1/4	3/4	5/16	1 1/32	1 1/4
5	4 × 5/8	4 1/32	4 1/64	21/32	41/64	2 1/8	5/16	1	...	1 11/32	1/4
	4 × 1	4 1/32	4 1/64	1 1/32	1 1/64	2 1/8	5/16	1	...	1 11/32	1/4
	4 × 1 1/2	4 1/32	4 1/64	1 17/32	1 33/64	2 1/8	5/16	1	...	1 11/32	3/4
	4 × 2	4 1/32	4 1/64	2 1/32	2 1/64	2 1/8	5/16	1	7/16	1 11/32	1/4
	4 × 2 1/2	4 1/32	4 1/64	2 17/32	2 33/64	2 1/8	5/16	1	7/16	1 11/32	3/4
	4 × 3	4 1/32	4 1/64	3 1/32	3 1/64	2 1/8	5/16	1	7/16	1 11/32	1 1/4
6	5 × 5/8	5 1/32	5 1/64	21/32	41/64	2 1/8	5/16	1	...	1 11/32	1/4
	5 × 1	5 1/32	5 1/64	1 1/32	1 1/64	2 1/8	5/16	1	...	1 11/32	1/4
	5 × 1 1/2	5 1/32	5 1/64	1 17/32	1 33/64	2 1/8	5/16	1	...	1 11/32	3/4
	5 × 2	5 1/32	5 1/64	2 1/32	2 1/64	2 1/8	5/16	1	7/16	1 11/32	1/4
	5 × 3	5 1/32	5 1/64	3 1/32	3 1/64	2 1/8	5/16	1	7/16	1 11/32	1 1/4
	5 × 4	5 1/32	5 1/64	4 1/32	4 1/64	2 1/8	5/16	1	7/16	1 11/32	2 1/4

All dimensions are given in inches.

[1] Blanks are designated by the basic outside diameter and width.
[2] Blanks made of high-speed steel shall be stamped H.S.
[3] Six adjusting holes shall have a minimum depth of 1/4 in. greater depth or through holes optional. Adjusting holes shall be equally spaced on the C diameter circle and slightly chamfered.
[4] Diameter of adjusting holes D shall be ±0.002.
[5] Diameter C of location circle shall be ±0.002.
[6] Bolt hole E shall have a tolerance of +0.003, −0.000 with 45 deg chamfer at both ends.
[7] Diameter H shall have a slight radius at the bottom of counterbore.

Webber MICRO ACCURATE Gages

The mark of

PERFECTION *in* GAGE BLOCKS

● Among thousands of users of gage blocks—*all over the world*—the Webber trade mark is recognized as the mark of perfection.

By perfection we mean gage blocks that are dependably accurate, long-wearing and backed by prompt, capable, willing service.

Webber gage blocks are the product of the largest exclusive producer of gage blocks. Long years of experience and extensive resources of the Webber organization assure constant product improvement.

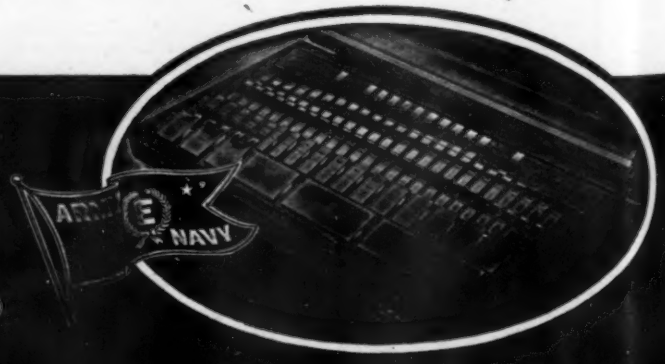
Look for the Webber "mark of perfection" when you buy gage blocks—you can depend on it.

Webber Gage Blocks are furnished in "A" accuracy sets to .000004 of an inch—in "B" accuracy sets to .000008 of an inch.

Prompt delivery on the following sets—

Set No. 84A—$350.00
Set No. 84B—$235.00
Set No. 43A—$185.00
Set No. 43B—$150.00
Set No. 38A (Thin Blocks) $195.00
Set No. 38B (Thin Blocks) $155.00
Set No. 14A (Angle Blocks) $450.00

Webber's service includes complete facilities for inspecting—reconditioning and replacing worn or damaged blocks at a moderate cost.



Webber GAGE COMPANY

12901 TRISKETT RD., CLEVELAND 11, OHIO

Circular Forming Tool Blanks and Mounting—IV

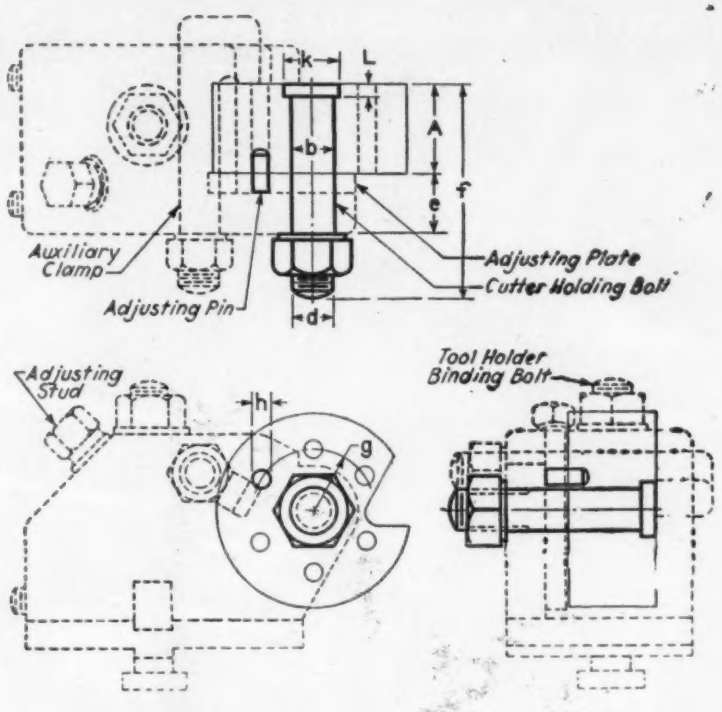


Table 7 Typical Circular Forming Tool Holder for Machines in Groups 4, 5, and 6

Machine Group Number	Width of Blank	Bolt					Adjusting Pin		Tool Post
		Length[1]	Thread[2]	Body[3]	Head		Radius[4]	Diameter[5]	
	A	f	d	b	k	L	g	h	e
4	½	2 ½	¾–10	0.749	1	¼	15/16	0.248	1 ⅛
	¾	2 ¾	¾–10	0.749	1	¼	15/16	0.248	1 ⅛
	1	2 ¾	¾–10	0.749	1	¼	15/16	0.248	1 ⅛
	1 ½	3 ½	¾–10	0.749	1	¼	15/16	0.248	1 ⅛
	2	3 ½	¾–10	0.749	1	¼	15/16	0.248	1 ⅛
	2 ½	3 ½	¾–10	0.749	1	¼	15/16	0.248	1 ⅛
5	⅝	3	1 – 8	0.999	1 5/16	5/16	1 1/16	0.310	1 ⅜
	1	3 ¼	1 – 8	0.999	1 5/16	5/16	1 1/16	0.310	1 ⅜
	1 ½	3 ¼	1 – 8	0.999	1 5/16	5/16	1 1/16	0.310	1 ⅜
	2	4 ¼	1 – 8	0.999	1 5/16	5/16	1 1/16	0.310	1 ⅜
	2 ½	4 ½	1 – 8	0.999	1 5/16	5/16	1 1/16	0.310	1 ⅜
	3	4 ½	1 – 8	0.999	1 5/16	5/16	1 1/16	0.310	1 ⅜
6	⅝	3 ¼	1 – 8	0.999	1 5/16	5/16	1 1/16	0.310	1 ⅝
	1	3 ¾	1 – 8	0.999	1 5/16	5/16	1 1/16	0.310	1 ⅝
	1 ½	3 ¾	1 – 8	0.999	1 5/16	5/16	1 1/16	0.310	1 ⅝
	2	4 ¾	1 – 8	0.999	1 5/16	5/16	1 1/16	0.310	1 ⅝
	3	4 ¾	1 – 8	0.999	1 5/16	5/16	1 1/16	0.310	1 ⅝
	4	4 ¾	1 – 8	0.999	1 5/16	5/16	1 1/16	0.310	1 ⅝

All dimensions are given in inches.

Tolerance for dimensions not otherwise specified shall be held to ±0.010.

[1] Tolerance for length of bolt *f* is ±1/32.

[2] The screw thread *d* shall be made to Class 2 (NC 2, ASA B1.1–1935).

[3] The body of the screw *b* shall have a tolerance of +0.000, −0.001.

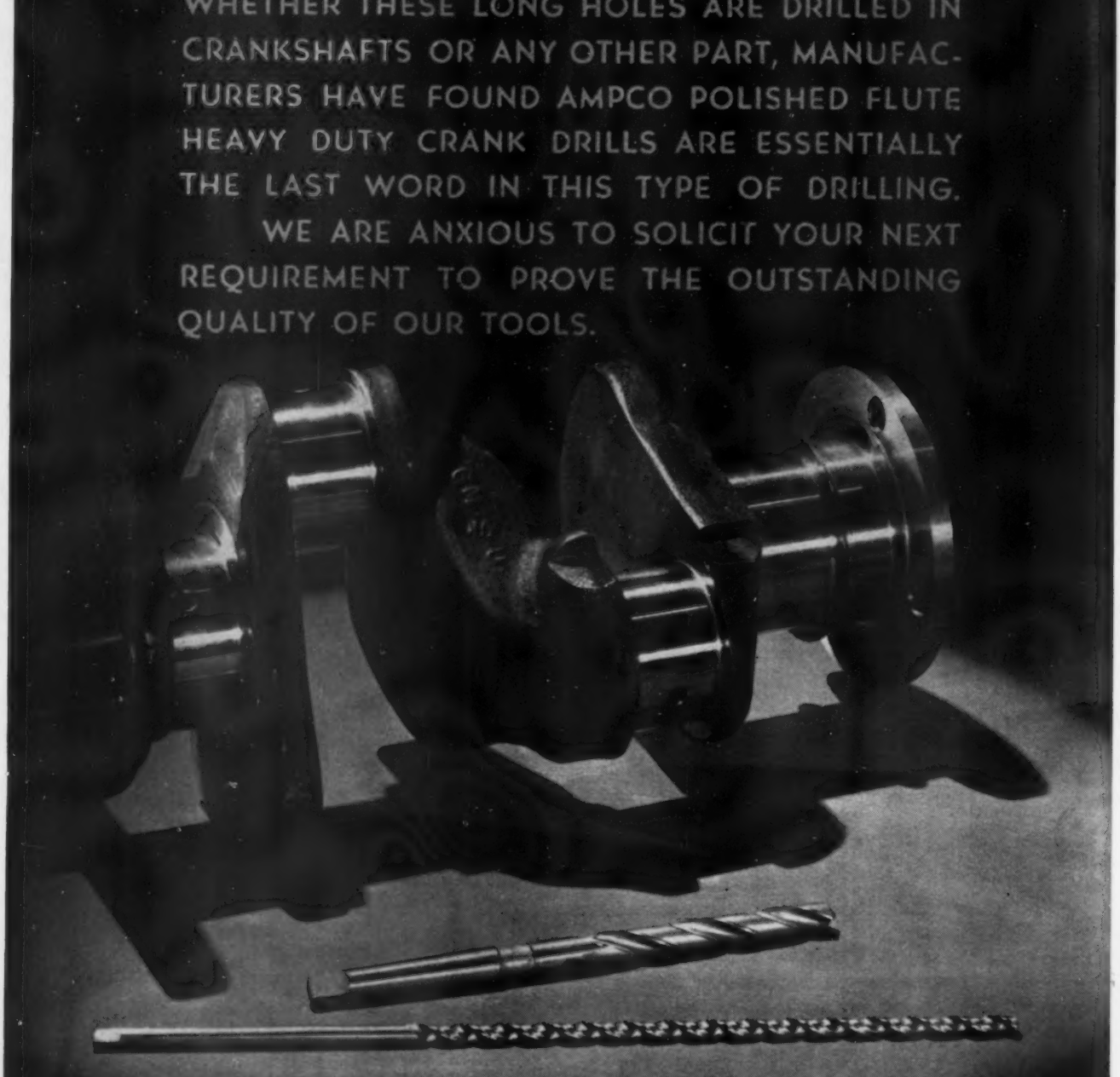
[4] Tolerance for the radius of the adjusting pin *g* is ±0.001.

[5] Tolerance for the diameter of the adjusting pin *h* is +0.000, −0.001.

DEEP HOLE DRILLING

WHETHER THESE LONG HOLES ARE DRILLED IN CRANKSHAFTS OR ANY OTHER PART, MANUFACTURERS HAVE FOUND AMPCO POLISHED FLUTE HEAVY DUTY CRANK DRILLS ARE ESSENTIALLY THE LAST WORD IN THIS TYPE OF DRILLING.

WE ARE ANXIOUS TO SOLICIT YOUR NEXT REQUIREMENT TO PROVE THE OUTSTANDING QUALITY OF OUR TOOLS.



TRULY QUALITY TOOLS

AMPCO TOOLS

AMPCO TWIST DRILL CO.

JACKSON, MICHIGAN U. S. A.

CHICAGO . DETROIT . CLEVELAND . PHILADELPHIA

Distributors in All Principal Cities

Adventure in Prosperity

THE BARUCH REPORT on postwar adjustment policies is "must" reading for every business man and industrialist.

If confusion prevailed previously regarding the proper course to be taken in converting our industrial resources back to peacetime activities when the proper times comes, it surely has vanished as a result of Mr. Barauch's penetrating and far-seeing analysis of the problems ahead and how they should be solved.

Perhaps one might quarrel with details here and there, and with whether the Congress or the executive branch of government should be in control. Nevertheless Mr. Baruch has blazed a well-defined and direct trail for industry to follow toward a quick and sensible readjustment of its affairs.

More important than that, the report is a guide for the government in its dealings with industry.

Nowhere in the entire report is better advice given than in the ten basic principles to control the sale of government surpluses, including plants, equipment and materials.

If these principles are adhered to, the disposal of surpluses is bound to be orderly and to disturb our national economy the least.

Among the principles are the following: sell as much as possible as early as possible without disrupting normal trade; no sales or rentals to speculators or promoters; get fair prices, with proceeds going to reduce the national debt; use the same regular channels of trade that private business would in disposing of the same properties; no government operation of surplus plants in competition with private industry; no monopoly, but equal access to surpluses for all businesses, and preference to local ownership; scrap what must be scrapped without deliberate destruction of useful property; assure our own productive efficiency on which our high wages and high living standards depend before selling surplus equipment abroad.

Mr. Baruch recommends that surpluses be disposed of in small lots to permit small as well as large business to participate. Surely no one can find fault with such a procedure. It spells fair play.

In his letter of transmittal of the report to Justice Byrns, Mr. Baruch lines up squarely on the side of those who envision great opportunity rather than discouragement in the years ahead.

Said Mr. Baruch, "With peace . . . each has the right to make what he pleases. . . . Markets become free and each individual is dependent upon his vision, his courage, his resourcefulness, and his energy.

"Everyone has the privilege of building up, but no one has the right to pull down. That is democracy at its best.

"In the reconversion and readjustment will come improvements in our standards of life—better houses, better clothes, better food, better health protection, and wider educational opportunities. These bring hope for the future instead of fear; they give security instead of unrest.

"There is no need for a postwar depression. Handled with competence, our adjustment, after the war is won, should be an adventure in prosperity."

If industry approaches the postwar era with the same bold and forward-looking resolution shown by Mr. Baruch, it will be well on its way toward the goal of full employment for which it will strive.

Burnham Finney

Gaging Business

War Production to Rise

Despite cutbacks and cancellations that continue to come from Washington, the overall war production program is scheduled to rise slowly but steadily to a peak in June of six to seven percent above the rate last December. Unless something should happen to alter plans, operations then will taper the last half of the year. Aircraft is responsible for the gain in output, because in most items the 1944 demand is less than the production total in the final quarter of '43. Though aircraft is not expected to go much higher in number of planes, the peak being a little over 9,000 units, output will soar more than 25 percent based on airframe weight or dollar volume. Ordnance equipment is being made at about 10 percent under the peak in last November, but will go up a bit until an anticipated sharp fall-off in May.

Bottlenecks Still Exist

Tight spots are still too numerous in the production program. Landing craft is perhaps the most difficult. It is expected that the rate of output will double the year-end schedule before long, but the peak probably will be attained by mid-year and a sliding off will be possible the latter part of '44. Heavy trucks, 2½ tons and over, diesel locomotives and portable cranes are on the "hard-to-get" list. Airborne radio is being produced in constantly growing volume. Radar output will rise steeply throughout the year. Bearings and motors, particularly fractional horsepower types, continue as serious bottlenecks, with backlogs running many months ahead. There has been an improvement, however, in many components that for months caused great concern.

Urge Conversion to Components

Though orders for machine tools improved slightly last month, machine tool builders again are being urged by Washington to take on direct war work to utilize their plants to full capacity. Many builders are doing that already, devoting a considerable amount of their facilites to aircraft parts in particular and to manufacture of axle parts and other items for heavy trucks. There is no change from early estimates that machine tool shipments this year will be in the neighborhood of $375,000,000, compared with $1,200,000,000 during 1943. An average peacetime year's output of machine tools ranges from $100,000,000 to $150,000,000. On top of this volume, the industry this year will do some $200,000,000 of non-machine-tool work. Russia is likely to get as much as $90,000,000 of American machine tools in 1944, provided that shipping space is available for that much. Machine tool shipments to England last year were only about one-half those the previous year, and this year shipments will drop off to a mere trickle.

To Produce Same Tonnage

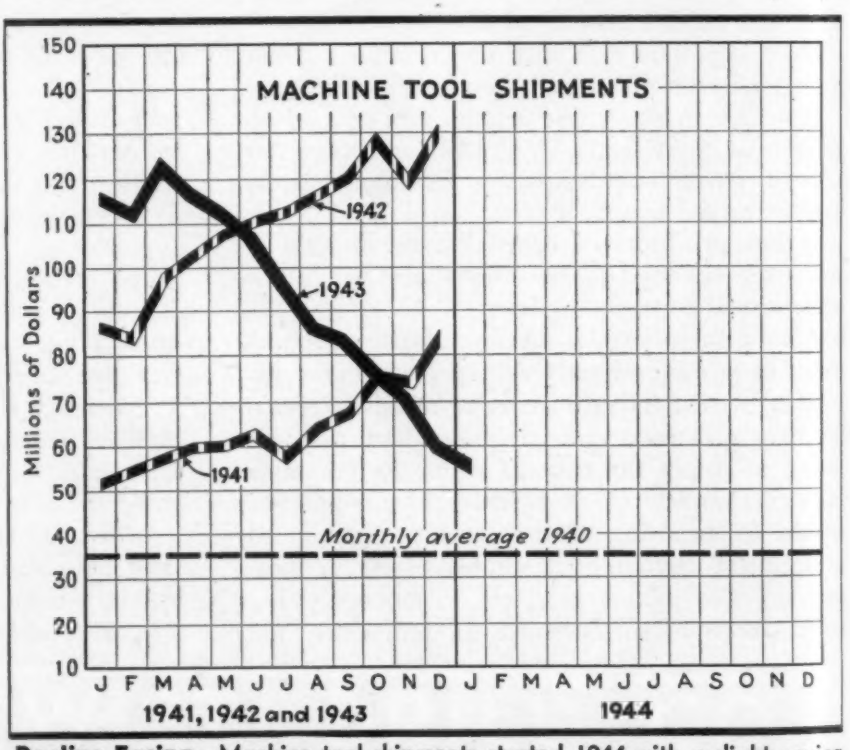
Merchant shipbuilding is proceeding according to schedule. Change-overs from one type of ship to another had an adverse effect upon tonnage turned out in January, but this setback is already being made up. The first few Victory ships are being produced and the number will rapidly increase as the year goes on, reaching substantial volume by April or May. This year Liberty and Victory ships will be in the ratio of eight to twelve. Labor turnover in shipyards still is close to 100 percent a year. Yards now are short 30,000 men. Steel also is tight, especially in shapes as well as plates. Total tonnage of merchant ships this year will be smaller than last, but the ship count will be the same.

Raw Materials Uses Shift

Shifts are being made in the uses of raw materials as supply conditions change. Aluminum is going into war products for which it was not previously available. Sheet-iron containers for certain military purposes, for example, will give way soon to those made of aluminum. In this case the tonnage is small, but it indicates the trend. Copper is replacing steel not only for artillery shell cases, but for other war items. Steel orders show no tendency to fall off; plates are the tightest item and will continue in unusual demand until summer. Pipe and tubing are not as easy as they were, being needed for shipbuilding, aircraft and oil field work.

Shifting Demand Causes Standbys

All supplies and materiel for the European invasion are on hand according to the schedule set up. The fluidity of the war causes ups and downs in the demand for certain items, and that means shifting production around a good deal. Certain types of artillery shell, for instance, are coming back into production because they have proved effective in Italy and the American commanders there have asked for them. As a safeguard against being caught unprepared, Washington has decided to maintain a specified minimum output of certain war goods so as to be ready to swing into more active operations quickly if occasion demands. Costs will rise under such a plan, since the advantages of mass production will be lost, but the program is the equivalent of a national insurance policy.



Decline Easing—Machine tool shipments started 1944 with a slight easing of 1943's sharp decline and signs of betterment. Preliminary estimates for January indicate shipments of $57,000,000, as compared to $60,680,000 in December; orders $29,000,000, as compared to December's $27,000,000; cancellations, January $3,000,000, December $7,000,000; backlog, January $180,000,000, December $211,751,000

Government Agencies Seek Machine Tool Disposal Agreement

Inter-service disagreement over price schedules bars the completion of a workable plan. Warehousing continues to be a major problem. Services survey demand for tools

WASHINGTON—Agreement upon a workable plan for disposing of surplus machine tools and other plant equipment is drawing nearer among the government agencies involved. A price schedule upon which all agencies can settle is the main stumbling block. Defense Plant Corp. is said to be the agency that is balking at an endorsement of a sliding scale of prices that is realistic. It is holding out for high prices, sticking to a schedule that calls for a discount of eight percent a year. Men familiar with the machine tool market believe that if such a schedule is adhered to, surplus machines will be overpriced 35 to 40 per cent.

It is a well-known fact that operators of metal-working plants will not pay such prices for war-used tools, especially as soon as the war crisis ends. The War Department is cognizant of this situation and advocates the establishment of a "common-sense" price schedule now. There appears a good chance that all agencies, including DPC, eventually will come around to the practical point of view of the War Department whose program may go to Mr. Baruch as a recommendation of all the interested agencies.

Warehousing Plans Indefinite

One of the chief problems in clearing plants of machines that contractors don't wish to buy is where to store them. Few warehouses are or will be available. The Navy has no warehousing plan; neither has DPC. It appears likely that DPC will ask the Ordnance Department of the Army to store its equipment, but Ordnance already is over-burdened. Government departments, including the Army Service Forces, are reluctant to erect any more warehouses this far along in the war, especially for postwar purposes. The result is that some thought is being given to the necessity for storing surplus machine tools outside, possibly in railroad yards. Even though precautions were taken, tools so stored would deteriorate rapidly. Moreover, they would be hard to inspect and would create in the minds of the prospective buyer the thought that if he waited awhile, he could get what he wanted dirt cheap. Whether railroad yards actually will be used for storage is not yet decided.

Survey Postwar Sales

Recently a questionnaire was sent out by the joint services to manufacturers asking in dollars how much of the machinery in their plants they will want to buy, how much to store and how much to be removed. It is believed that the results of this survey won't be worth much, however, because one must know the specific pieces of equipment that a company wants before anything much can be done. Last summer the War Department made an inventory in numbers of machines of its equipment ownership. DPC is in the process of making a survey of its equipment which is about 60 percent completed. The Corps of Engineers is now getting out brochures of the plants and equipment to be sold by all government departments.

The War Department today owns 128,000 machine tools and the Air Corps 16,000. DPC has financed most of the equipment put into plants doing Air Corps work. To be specific, it has bought and still owns $1,350,000,000 of machine tools for the Air Corps. The government is estimated to have something like $2,500,000,000 of machine tools and probably will retain after the war about 10 percent of them for standbys, arsenals, etc.

CUT RELEASES WORKERS

BRIDGEPORT, CONN. — Schedules of curtailment of small arms production, announced by Brig. Gen. G. Y. Drewry, commanding, Springfield Ordnance District, will make about 2,000 employees of Remington Arms Co. available for transfer to other war plants in the area. Officials of the local U. S. Employment Service offices said they could place several thousand workers in plants making aircraft, invasion boats, trucks, radar and aerial torpedoes.

Insatiable Labor Seeks More; Steel Workers Would Top 15%

NEW YORK—There are the usual number of strikes and threats of strikes, there has been no appreciable decline in the amount of bickering and, on the whole, the labor front is as lively as ever. But, somehow, the clashes and disputes which are now reported have—except for their directly involved participants—an almost unreal quality. What is real, and that on which attention is almost completely centered, is the approaching showdown on our wartime wage policy that is being forced by organized labor.

Twenty months ago, the National War Labor Board wrote the Little Steel formula. The board was acting in a case in which C.I.O.'s steelworkers' union demanded thumping wage increases of the steel industry. The decision in that case provided a pay boost of 15 percent which was to compensate the steel workers for the 15 percent rise in the cost of living which had developed since January, 1941. That 15 percent wage increase became NWLB's Little Steel formula and has been applied to all industry.

Goal Became Limit

For better than a year, the 15 percent proposition was a wage increase formula as NWLB awarded pay hike after pay hike to bring all hourly wages up 15 percent above their January, 1941 level. Then, that job nearly completed, it became a wage limitation formula, for its corollary—fitted into the overall economic stabilization program—was that while wages could go up that much they should not go beyond the limit of that ceiling.

Consequently the continued application of the Little Steel formula has become the dike holding back a veritable flood of union demands for more pay. John L. Lewis and his miners found a hole in that dike, which he called portal-to-portal compensation, and other labor groups have found other openings. But the overwhelming majority of organized labor has been effectively blocked off and wage control has been perhaps the most effective aspect of economic stabilization.

Demands Exceed Ceiling

Now the steelworkers are back knocking at the door. Their union is demanding a 17 cents an hour pay boost, every penny of which is over what the formula allows. Behind them is the fully united strength and pressure of all organized labor, A.F.L. as well as C.I.O. At stake is the nation's present wage control policy and the unions will not be deterred by their no-strike pledge in going all out to break that policy.

Imminent, therefore, is either a national wage increase or a series of strikes that will have a serious effect on war industry—or maybe both, for the strikes may be the convincers that the government will need before concluding its wage policies are no longer tenable.

Until organized labor has either conclusively won or lost its wage formula fight with the government, the labor front will be unsettled, unpredictable, and unreal.

Iron Doughboy — Stripped to essentials, the 70,000th locomotive built by The Baldwin Locomotive Works and being inspected by President Ralph Kelly, his operations assistant, W. H. Holcomb and W. G. Stetson, general foreman of the erecting shop, is of the same type as many now being used in military operations abroad. This engine is one of several built for the U. S. Army

Baruch Report Urges Speedy Settlement, Conversion Aid

WASHINGTON—The report Bernard M. Baruch, head of the War and Postwar Adjustment Advisory unit of the Office of War Mobilization, submitted to OWM Director James M. Byrnes urges adoption of clearly defined plans for speedy payment of terminated contracts, government aid toward early reconversion to civilian production and establishment of a Surplus Property Board to work with the claimant agencies in the early and equitable sale of surpluses.

A continuing role for the industry advisory committees set up by WPB is urged; they are referred to as "the best group to advise on all the many problems of industrial demobilization."

Rapid and final settlements of contracts immediately on cessation of war production is urged. The profit on goods begun but not completed would be limited to 6 percent. Contract termination recommendations follow closely the Uniform Termination Article for Fixed-Price Supply Contracts approved by Mr. Byrnes and issued by the OWM.

Would Protect Subcontractors

While emphasizing speed, finality and protection of the government, the report recommends: That procurement agencies be authorized to protect subcontractors in event of insolvency or default of primes; that there be prepared standard contract termination article for subcontractors to supplement the uniform termination article for primes; that the Director of War Mobilization set a minmum figure below which "nuisance-size" claims can be immediately validated with suitable safeguards; that procurement agencies launch a vigorous experiment with the so-called company-wide type of settlement, and that Congress enact appropriate legislation to permit such settlements to the extent found practicable.

Necessary considerations in cancellations of contracts to aid reconversion, the report says, include preference for such factors as releasing plants readily convertible to desirable peacetime production, giving to smaller enterprises a chance to return to normal business earlier, balancing of cancellations in various communities and planning of cancellations in war-swollen communities

Would Channel Surplus Sales

Immediate creation of a post of Surplus Property Administrator in the Office of War Mobilization with full responsibility and adequate authority for dealing with all of the aspects of surplus disposal is recommended. The report suggests the creation of a Surplus Property Policy Board, comprised of representatives of twelve government agencies and departments, to devise policies, press for early sales, and enlist the aid of the armed services in exploring critical civilian needs with a view to determining what could safely be released. The Board would also develop with the armed services for ultimate approval of the President and Congress a stand-by program of reserve plants, equipment and other properties for future security, devise effective inventory controls and organize in advance demand for surpluses, including possible need for foreign relief.

Under the program, disposal of capital and producer goods, covering all types of industrial property, including plants, equipment, materials and scrap, would be by a corporation within RFC.

Bill Would Set up Termination Agency, Assure Fair, Prompt Pay

WASHINGTON—Senators James E. Murray, head of the Special Committee on Small Business, and Walter F. George, chairman of the Committee on Finance, have introduced in the Senate a legislative program for uniform termination of war contracts, designed to facilitate maximum production now and expedite reconversion to civilian operation, assure speedy and final settlement, prevent improper payments and aid in prosecuting fraud.

The legislation would establish an Office of Contract Termination Settlement, headed by a director, who would receive aid in settlement and interim financing problems from an advisory board consisting of the heads of the principal procurement agencies.

The policy of the government, as defined by the measure, would be to insure to every war contractor fair compensation for the termination of any contract. This compensation could include reasonable expenses incident to termination settlement, expenses of removing and storing materials and an allowance for profit on the work done on the uncompleted part of the contract, plus interest on the termination claim at a rate of 3 percent.

Contracting agencies functioning under regulations issued by the director, could settle termination claims by agreement, which would be final except in instances of fraud. However, such settlements would be subject to renegotiation for recovery of excessive profits.

Where no agreement was reached, the contracting agencies would make findings as to the amount due, which findings would be subject to appeal by the contractor to an appeal board or court, or might be submitted to umpires or to arbitration.

Inside Detroit

BY SILER FREEMAN

The reshuffling of the automotive industry after the war is expected to bring wide changes but none so extensive as in the parts manufacturing end. Just how far these changes will go is hard to judge immediately but a recent survey, undertaken by the Automotive Parts and Equipment Manufacturers Association, gives some clues which are being studied carefully by the industry.

Change is Significant The results of the survey were given out almost simultaneously with the first meeting of the association in three years and the announcement of the change in its name. The group has widened its activities to include not only the automotive parts men but the aviation equipment makers as well. That in itself is significant. It is now the Automotive and Aviation Parts Manufacturers, Inc.

First of all, Frank Rising, general manager of the group, revealed that the 392 members of the association are doing better than three billions of dollars a year in business. And of this 29.3 per cent is aircraft, including airframes, engines, propellers, and parts and equipment therefor.

Military Vehicles Predominate Of course, the parts makers have not gone entirely out of the automobile business. The survey showed that 28.7 percent of the $3,000,000,000 business is still devoted to vehicles and parts, principally military. But more than a fourth of the entire 1943 business was the familiar cars, trucks, etc.

Strikingly enough, tanks and parts for them rank third with 15.8 percent. Ammunition, including shell cases and projectiles, accounts for 13.7 percent. Artillery, small arms, etc. make up 3.6 percent and marine equipment 3.4. Machines, tools, jigs, fixtures, etc. are only .6 of 1 percent and miscellaneous the remaining 4.9 percent.

Few Will Leave Field What about postwar? The parts men are pretty much realists. Despite their frequent clashes with the auto manufacturers and lots of dissatisfaction with their treatment at the latters' hands, most of the group surveyed by Rising's organization will be back in the automotive field. A small number, six out of the 204 questioned, will remain in the aviation field. Twelve others will be in other fields, such as the electrical and home appliance.

But the aviation field will not be entirely abandoned. Nearly 30 percent stated they would be secondarily interested in plane manufacture after the war. An even higher percentage indicated an active interest in fields others than aviation and automotive, indicating a possible sweeping change in the lineup. Only eight out of the 204 planned to get out of the automotive work entirely but dissatisfaction may cut down that field greatly.

Auto Man Interested The auto manufacturers are watching very closely this shift in their suppliers and subcontractors. The recent meeting of the parts association was attended by a large number of high-up automotive executives. While it was ostensibly a bit of good fellowship on their part, it was also to learn what the parts men had in mind for after the war.

The way the automotive industry is set up, a great part of the success of the industry is tied up in these suppliers. The length of time it will take to get back into peacetime production depends on these manufacturers.

What if the parts men find their present lines more profitable or better suited to their present setups, and they refuse to go back to the automotive field? There is some reason to believe that there is thinking along these lines and this is disturbing to the auto industry. A high executive stated recently that fully one-third of the parts men would never return to their old fields. If this is so, it will make a big hole in the postwar setup.

The car manufacturers can study this part of the survey:

Out of the 204 companies which filled out the questionnaires, 124 expect to stay in aviation work and only 77 expect to drop out of this field entirely; three are in doubt. As said before, however, they are realists and only six have indicated that aviation will be their main postwar objective.

MESA Efforts Continue The recent trouble in the war plants with the Mechanical Educational Society of America is not settled by any means. The War Labor Board has again turned down their plea for representation but that

M.E.M.A. ANNOUNCES ELECTIONS

NEW YORK—The Motor and Equipment Manufacturers Ass'n. has announced its officers for the current year. John W. Anderson, The Anderson Co., is to be president, while John M. Spangler, National Carbon Co., will serve as vice president. A. B. Bussman, Bussman Manufacturing Co., was elected secretary and Clyde P. Brewster, K-D Manufacturing Co., was chosen as treasurer.

Elected to serve as members of the executive committee, in addition to the association president, vice president and treasurer, are: E. J. Wilcox of J. H. Williams & Co., and Will Dammann, Bear Manufacturing Co.

Production Line X-ray—A conveyor carries high-stress airplane parts castings before X-ray equipment, developed at Fisher Body Division's Ternstedt plant to keep pace with assembly line methods. The machine is a time and labor saver

doesn't mean that Mathew Smith, the MESA's hard-boiled spokesman and secretary, will take it lying down.

Smith is determined that his organization will survive. He claims that he is in a battle for survivorship, the recent trouble starting in Toledo over what he claimed was a raid on his ranks by the CIO.

Smith is tough and realistic. The job shops are pretty much at his mercy and he knows it. Although the shops claim that their relations with their tool and die men have been tranquil, most of them obeyed Smith's orders to stop work. Those who didn't face discipline, which the alien secretary is not afraid to mete out. The final test is still to come.

Layoff Rumors Blamed

The recent wave of strikes and production tieups is being blamed on the unrest in the war plants, caused by rumors of layoffs. Thus far, the layoffs have not materialized except in isolated instances and none has been long.

Nevertheless, talk continues and with it the fear that the lush era of high wages and overtime is at an end. Therfore, slowdowns and strikes. Transfers are sought by many who want to get placed in plants with good postwar prospects.

All in all, it adds up to loss of output which could be well used in the campaign being waged by the services. It is a mistake in policy which both the government and management could very well correct. They have had a taste of the kick-backs from the hush-hush policies.

For instance, in Cleveland last summer rumors spread that the Fisher Body plant, which was hiring thousands, was to close up and the thousands on the pay rolls would be out of jobs. The plant was to have assembled the super-bomber, the B-29.

Secrecy Caused Rumors

It was true there had been a shift in the plans for the Cleveland Fisher plant. Instead of the super-bomber, it was transferred to making the P-75, the super-fighter which Don Berlin had designed. It would need just as many on this job as on the B-29.

But the workers hadn't been taken into the confidence of government or management and the rumors grew apace. Applications for releases came by the hundreds. Those who couldn't obtain them left anyway. It looked like Fisher would be up against it for manpower.

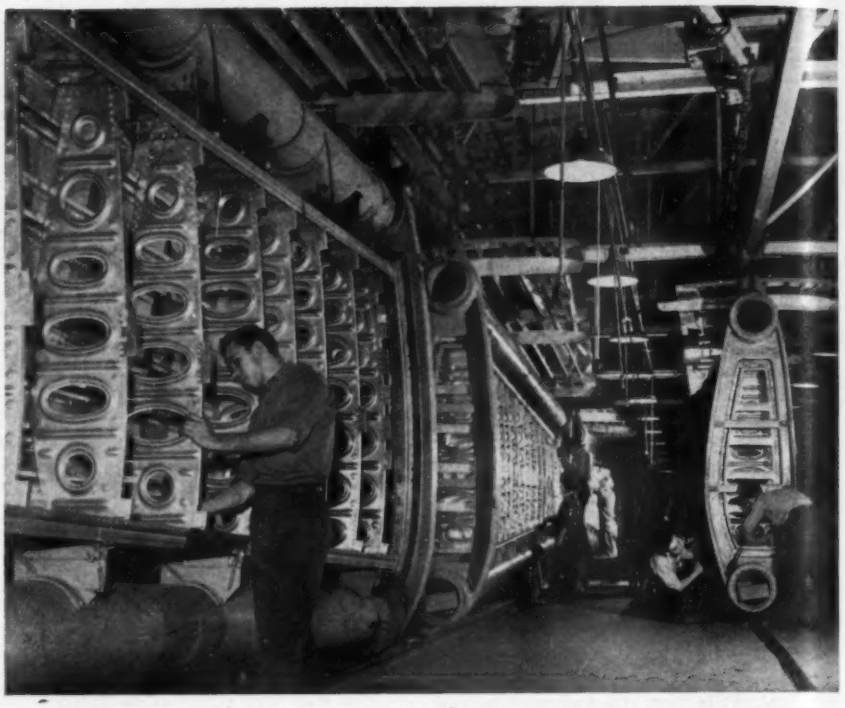
The final upshot was that the workers were told of the change in plans and assured that they would be taken care of, that they would have jobs for months to come. The working force was stabilized and production went forward on schedule.

Another example was furnished recently by the Evansville, Ind., plant of Chrysler, managed by Charles I. Jacobson, former Chrysler division sales manager. The plant was making ammunition. Recently, schedules were cut back severely, necessitating a 50 percent reduction in the working force. As soon as he was notified, Jacobson had notices posted for his working force to see. Those who were to be laid off were sent letters, signed by Jacobson, giving the reason.

Chrysler Helped Find Jobs

In addition, the workers to be laid off were called in to the supervisor's office and told personally why the shift. Not satisfied with this, the company invited other firms in Evansville and surrounding cities to send their hiring staffs into the Chrysler plant and interview the workers whom Chrysler was laying off. In this manner, many were able to obtain work without losing much time or wages. The management's frankness won the worker's cooperation and there was little or no resentment.

The Army has used this approach as part of its strategy in its present campaign. Before a big offensive, even the men in the ranks know exactly what is going to happen and it has produced good results. The same confidence will reward both government and labor on the production front, even such an exponent of management as F. C. Crawford, president of Thompson Products and former head of the NAM, believes.



Air Line—Wings for the B-24 Liberators produced by American Central Manufacturing Corp. in its Connersville, Ind. plant are assembled in jigs traveling on a conveyor the length of the leg of a T-shaped building. Bottom skins are drilled and fitted into position at the head of the line, then loaded onto wooden racks at the top of the jig to await completion of interior work further along the line; thereby they are on hand for final assembly when needed

Brazilian Steel Industry Produces 45 Pound Rails

RIO DE JANEIRO—The plant of the Companhia Siderurgica Belgo-Mineira at Monlevade is producing 45 lb. rails for use on Brazilian railways. Rails in excess of 65 lb. are to be produced at the under-construction Volta Redonda steel plant.

Production of light steel rails at Monlevade was encouraged by President Getulio Vargas and by the Minister of Transportation and Public Works for the 310-mile railroad line being built to connect those of the southern and southeastern sections of Brazil. The United States has aided in the wartime expansion of the country's steel-making facilities.

Steel as an important industry has risen in Brazil only since 1937, when operations were expanded at the Monlevade plant of the Belgo-Mineira company. The steel industry, which currently provides only 35 percent of the country's needs, will have its capacity almost doubled when the Volta Redonda plant, 80 miles inland from Rio De Janeiro, begins operation late this year.

The more you give—
the more will live
1944 RED CROSS WAR FUND

Wartime Washington

Washington is thinking in terms of a longer war than the general public had been led to anticipate. It also is convinced that after the war is won with Germany, the cutbacks and cancellations in war production programs will not be as extensive as earlier estimated. At last the realization has struck home that the war is not going to be a pushover in either the European area or the Pacific. Even if the European phase terminates, and a large amount of equipment is transferred from Europe and Africa to the Pacific theater, we will not be able to win the war with Japan with our enormous stores of munitions plus greatly reduced production. We shall have to keep output moving along at a high rate.

Less Curtailment Seen

Not so long ago it was figured that war output would be off at least 50 percent after Germany is licked, and perhaps nearer 60 percent. Today it is believed that curtailment would not run more than 30 percent and possibly as low as 20 percent in the year following Germany's defeat. Aircraft obviously would be cut the least. Naval aircraft would not be decreased at all; the entire decline would be in planes for the Army. Naval ships that could not be completed by specified dates in 1945 and 1946 (assuming the German phase ends next fall) would have the work on them stopped altogether. But a tremendous number of ships still would be coming through as scheduled. The big slash would be in ground force equipment (ordnance), which would drop some 60 percent. The ordnance program may be in such good shape that an even greater decline than 60 percent would seem justified, but if the war in the Pacific is then raging, caution alone would prevent cutting down schedules farther.

Manpower to Pace Conversion

If the production program for the Pacific war is to be as high as indicated after the war with Germany, one might think that little material would be available for manufacture of civilian goods. It is figured, however, that with production sliding only 20 to 30 percent, as much steel will be available for non-military uses as the country consumed in 1937 (which was a good year). Copper equal to the 1939 consumption would be released for civilian products, and two-thirds as much aluminum as was consumed in 1939. Approximately one-third of the country's productive facilities could be employed for civilian manufacture, but probably only 12 to 15 percent of the labor. Instead of worrying about unemployment, the chief problem will be to secure labor, which will be a real bottleneck.

Reconversion not Pushed

This is an entirely different story from the one that Washington has been telling the country until recently. It changes radically the timing of reconversion of huge segments of American industry. It means that resumption of civilian production on any sizable scale at all in 1944 is rapidly fading and, in fact, might as well be counted out. It means that plans for motor car makers to begin tooling up and building new automobiles must be postponed at least until late in 1944 or more likely until 1945. Whatever civilian goods are to be permitted this year will be exceedingly small, simply because the war program will continue of such proportions that labor or component parts or plant facilities (not materials) will not be at hand to do a bigger job. To be specific, 80 percent of the manufacturers of civilian goods that are needed the most are in tight labor areas and their plants are now being devoted to war work exclusively. There is still a point seldom mentioned that contributes to the present situation that is unfavorable to resumption of non-military goods production: the people in charge of the civilian economy program have not come up with any urgency list as yet, as the Army and Navy have on military items. The lack of aggressive handling of this phase of the program is retarding efforts to reconvert.

Medalist — Rear Admiral H. G. Bowen, USN, was awarded the Newcomen Medal for Achievement in Steam by The Franklin Institute of the State of Pennsylvania, "In consideration of his . . . work . . . and advocacy of the advance of steam engineering in this branch of our national defense . . ."

Lumber: Leading Scarcity

Metal-working industries use lots of lumber, especially in crating products for shipment. Many people have not awakened to the fact that lumber today is the most critical material in the war effort. As long as the war lasts, the lumber situation is expected to be tough. No material is quite so necessary in following an army into a captured area as light lumber. Warfare today destroys areas before they are taken over, and the first job upon taking over a new territory is to restore essential services. It took tens of millions of feet of lumber to put Naples harbor back into usable condition. The same sort of thing will happen elsewhere as our forces move in. Army trucks, made of steel and wood, have a relatively short life. In certain parts of the world, our portable saw mills are building common products out of fine woods simply because no other wood is available. Crating of war goods is now taking some 50 percent of all the lumber being produced.

Draft Boards get Hungry

Metal-working shops must be prepared to surrender many men to the Army and Navy in the months immediately ahead. The reason is simple. The Selective Service system is getting closer to the bottom of the manpower barrel and can afford less than ever to defer men unless absolutely necessary. By July the Army will have 7,700,000 men and the Navy 3,600,000, or a total of 11,300,000. The building of both services will then be completed; from that time on the job will be to hold the line. To raise the number of men to the desired level and to replace men now being discharged (over 75,000 a month), it is essential for Selective Service to find 800,000 men by July 1. The services asked for 300,000 in January, and 200,000 were produced. After July 1 about 150,000 men a month will be needed, because discharges will rise rapidly in volume and replacements must be made. The number of inductees from the ranks of fathers has been disappointing. By February 1 it was hoped that 400,000 would be secured, but actually only 172,000 had been taken. When fathers were first called, they showed up 13 percent better physically than the single men, but lately they have been running four to eight percent below the latter. The fathers, after all, average about 32 years of age, whereas the single men average 25; youth obviously should make a better showing physically than older men. Close to 100,000 youngsters a month are reaching the age of 18 and becoming eligible for military service.

Marine Miller—This 16-ton, 21 x 23 x 5 ft., axial and radial milling machine facilitates production of Victory ships. Lowered into the hold it mills turbine gear foundations to 0.0015 accuracy in few hours, as compared to 10 to 12 days formerly required by 12 to 15 machinists doing it by hand. It was designed by Michael Zaustinsky, chief of the machinery specialty division, and Steve Kongelbeck, chief of plant engineering, California Shipbuilding Corp.

Chicago Labor Turnover Leads; Drive Started; Production Lags

CHICAGO—This area will be placed in a Group 1 labor shortage classification on March 1, if the warnings and predictions that have been made here recently mean anything. According to personnel men in the large metal working plants, the labor market is growing tighter in this area, although loosening in other cities.

Paul V. McNutt, War Manpower Commission chairman, pointed out recently that the labor turnover in Chicago is two points higher than the national average and three points higher than the Detroit rate. The net turnover here of 9 percent, coupled with the labor shortage, creates a serious production bottleneck, he asserted.

Turnover is Large

According to his report, in a two month period 110,000 workers were hired here, but losses offset all but 13,000 of that number. A special study of 57 key industrial establishments employing 240,000 showed that although these firms hired 33,000 workers, the net increase was only 3,000.

Included in the survey were firms producing ordnance, aircraft and parts, machinery, including electrical equipment, and other plants with war contracts. Ordnance manufacturers had an average turnover rate of 9 percent. The highest rates were shown by firms producing small arms ammunition, some exceeding 11 percent turnover.

In the iron and steel division, many of the reports were even worse. Manufacturers of steel and turbine castings revealed a turnover rate of 13.4; manufacturers of sheet aluminum, 17.4; other aluminum and magnesium products, 11.9.

Meanwhile, Mayor Edward J. Kelly has organized a War Mobilization Committee, including more than 1,200 industrial, labor, and civic leaders, in an attempt to forestall reclassification of the city, with the attendant loss of new war contracts; but manufacturers here are not too optimistic about the success of any drive now.

Production is Lagging

Reports in Chicago have been that production, because of the worker shortage, is lagging particularly in aircraft engines and parts, heavy machinery, and electronic equipment.

To avoid a Group 1 rating, Chicago industries need 94,600 additional workers at once. The labor supply in sight totals only 59,000, and included in that figure are almost 40,000 housewives, trade and service workers.

FARM MACHINERY SALES OFF

WASHINGTON — Farm-machinery sales in Canada decreased decidedly in 1943. Total sales of tractors for all of Canada dropped from 17,162 in 1942 to 7,456 in 1943; sales of thresher from 640 to 157; and combines from 4,576 to 2,525. Sales of swathers and pickups amounted to 205 and 1,935 respectively in 1943.

ASTE Shapes Annual Meeting To Fit Wartime Limitations

DETROIT—An innovation is scheduled for the opening technical session of the annual meeting of the American Society of Tool Engineers, Bellevue-Stratford Hotel, Philadelphia, March 26 to 28. The first technical meeting, Monday morning, the 27th, will consist of the presentation of a series of papers discussing all the factors relating to the preparation for an actual manufacture of a vital war product. The papers presented will provide an integrated picture of all the problems involved and how they were met.

To Consider Surface Milling

Monday afternoon's session will be devoted to new developments in surface finishing methods, with particular stress on honing, through papers by Kirk W. Connor, president, Micromatic Hone Corp., and A. F. Hasty, Sunnen Products Co.

The Monday evening meeting is to have as its subject the integration of manufacturing, tooling and personnel to produce war products, with William Jack of Jack and Heintz, revealing the principles on which his company based its production achievements.

Tuesday morning a symposium, with a paper by T. R. Lawson, Electronic Control Section, Westinghouse Electric and Mfg. Co., in collaboration with two R. A. Cole, experimental engineer, Grinding Machine Div., Norton Co., and B. T. Anderson, electrical engineer, Sundstrand Machine Tool Co., will deal with electronics as applied to machining.

To Discuss Machining

Two of the most recently developed machining processes — fly-cut milling and broaching—form the nucleus of discussions at the Tuesday afternoon session. Ralph R. Weddell, president, Weddell Tools, Inc., will present the former.

The annual banquet, Tuesday evening, will close the session, with John H. Van Deventer, editor, *The Iron Age*, as the principal speaker. Ray H. Morris, A.S.T.E. president, will preside, with Past-President T. B. Carpenter as toastmaster. Installation of officers for the forthcoming year will take place at the banquet.

Committees Meet Over Weekend

Meeting of the various A.S.T.E. national committees are scheduled for Sunday, March 26, as well as an all-day meeting of the Board of Directors of the Society. Certain committees have been scheduled to meet in Philadelphia on Saturday, March 25, to prevent interference with later programed meetings.

Wartime conditions have caused no show to be scheduled and no blanket plant tours to be arranged, but a committee set up will assist any who wish to make plant visits in the area.

Spotting the Air News

5000 used airplanes: Defense Plant Corporation has started liquidation of its light training planes which it purchased during the past year and lent to the Civil Aeronautics Administration's War Training Service contractors. WTS is the war version of the old Civil Pilot Training program, set up by Robert Hinckley, former assistant secretary of Commerce for air, in a far-sighted preparation for war. All civil airplanes were frozen when the war started, and DPC bought the 5000 training types and allocated them, rent free, among WTS contractors, training pilots for Army and Navy. The military backlog of pilots is nearing completion; civil training auxiliaries are being curtailed, and will soon be terminated entirely.

Calls for bids on 765 WTS planes had been posted at this writing at CAA regional offices. It is estimated that about 1,000 will be released at this time. The other 4,000 will follow as the civil schools are shut down. Officials say they expect every plane to be grabbed—conclusion is that many pilots and students do not intend to wait for revolutionary designs expected after the war. They will be a long time coming. Nearly all flying in early peacetime will be in refined prewar types, both transport and private. The airlines expect to use Douglas DC-4s, Lockheed Constellations, Martin Mars flyingboats, and the like.

There are about 23,000 private planes in the United States, as compared with 25,000 before the war. Postwar models will be distinctly better, and the percentage of replacement will be very high, plus a new market in scores of thousands. But the new planes still can operate only from airports, and their use will be almost as limited as ever. The requirement for transport planes will be counted in hundreds at best. As engineers increase the range and speed and lift of transport planes they work themselves out of a job. A mere 50 or 100 50-passenger planes can easily handle all the transatlantic traffic for some time to come.

There is only one prospect in sight for volume sales of aircraft: that is the perfection of a roadable or direct lift (helicopter) type that your Uncle Byron can operate, economically, from where he and his folks live. Even the most stiff-necked engineers admit it will come, but few can see it in less than five, more in ten years. One other possibility, not yet in sight at all, is the invention of cheap aircraft power, which would permit the carriage of goods in volume. Right now the ton-mile and passenger-mile rates are subject to improvement only by laborious technical progress.

Step-by-step improvement of aircraft will go a long way while departures such as jet power and rotary wing lift are being developed. This is forcibly illustrated in data just released by the Army on Lockheed's improved P-38 Lightning fighter. With a 30 percent increase in horsepower of its two Allison engines, from 1,150 to 1,500 h.p. each, and by using an improved turbosupercharger and new intercooler, the P-38 has increased its rate of climb 100 percent above 30,000 feet; pushed its service ceiling above 40,000 feet with better performance at all altitudes; increased its speed at all altitudes; increased its one-engine speed to 300 m.p.h. The ship's range is increased 30 percent, enabling it to accompany bombers to Berlin. This great improvement reflects much credit on the Lockheed and Army engineers, but it must be discounted for comparison with commercial aircraft, for it was done with little regard to cost.

Banjo Bag—Inspector Celia Imbier, Studebaker aircraft engine parts plant, Chicago, holds a master connecting rod inclosed in a zipper case to protect surfaces as the part moves through production

The struggle for economy in civil aviation is a never-ending paradox. The public was elated when pioneer operators set up a 31-hour coast-to-coast schedule. They loved the Ford tri-motors that came later. But now they want to make it between dusk and dawn. Next thing will be midnight to breakfast. If aircraft, both transport and private, were permitted to lumber along at 100 m.p.h., the engineers could cut costs. But neither owner-pilots nor passengers will let them, and speed costs money.

Notes for your book: Many aircraft manufacturers are studying the pressurizing of airplane cabins, both combat and commercial, for postwar practice. One problem is what happens to occupants when pressure suddenly is released, by bullet hits or otherwise. . . . Cost-saving factors of plastic tooling, largely developed by warplane firms, and its adaptability should make it a boon to many other industries. . . . British and American designers are squaring off for a rough contest in the development of efficient postwar transport airplanes.

Weighing In — Every 100th one of the hard hitting Flying Fortresses is carefully weighed as it comes off the assembly line, to determine if the center of gravity falls within the limits prescribed by designers. Two scales under the wings and a third beneath the fuselage (shown) give readings totaling the weight of the plane. Proper fixation of center of gravity insures stability in flight

Conversion, Development Plans Stir Canadian Industrialists

OTTAWA — Canadian industry got a welcome dose of tonic at the end of January when Prime Minister Mackenzie King's government announced at the opening of the 1944 session of parliament that legislation would be passed to provide it with important state aid in wartime reconversion and in development and expansion for postwar trade. But the stimulating effect was somewhat counteracted by intimations that the government's postwar trade policy contemplated reduction in tariff protection and by a report that it was actually flirting with a limited experiment in free trade itself with the United States on a few items, including automobiles.

Would Cut Taxes

Finance Minister J. L. Ilsley has become convinced that reduction of taxation on industry is necessary to ensure rapid reconversion and maximum employment in the period immediately after the close of hostilities. The need has been impressed upon him recently by the attitude of important units of industry towards postwar business.

Capital credits for industry are designed especially to encourage development of small and medium sized enterprises as a means of ensuring postwar employment. For the purpose an Industrial Development Bank is to be set up as a subsidiary of Bank of Canada, government-owned central bank.

Canadian Manufacturers Association has been urging revival and expansion of Canada's trade commissioner service, highly regarded before the war, in preparation for reopening of export trade. It also advocated setting up of a separate government Department of Reconstruction. The King government is acceding to both proposals.

Foresee Free Trade

Buried in the statement of the government's program at the opening of parliament was a sentence which Canada's tariff-protected industrialists consider ominous: "Larger imports are needed to raise the standard of living." It comes on top of other indications that the government is leaning heavily towards a postwar policy of freer trade. It was recalled that a few months ago Prime Minister King and his Parliamentary Assistant, Brooke Claxton, M.P., advocated before the U. S. National Trade Association a United Nations agreement for tariff ceilings and intimated Canada's willingness to go further and set an example to the world in lowering tariffs by a reduction agreement with the U.S.

Recently government economists and policy advisors have been studying a proposal for an experiment in reciprocal trade with the United States on a few items—automobiles, nonferrous metals, chemicals, one or two others.

The proposal was prompted by representatives from a few Canadian manufacturers who found that in war production they had substantially beaten their United States competitors.

Fear Trade Loss

Such industries as the automobile and electrical appliance industries are already worried about the prospective shrinkage of the prewar market they had in Empire countries, because of the industrial development that has taken place in these countries during the war and that is likely to be expanded after the war. They also face the prospect of losing the Empire preference in a postwar multilateral trade arrangement based on a triangular U. K.-U. S.-Canada agreement, the possibilities of which are now being explored. Canadian subsidiaries of U. S. companies are in the line of fire.

Plastic Tooling Group Formed

BUFFALO—With the announced aim of bringing together men responsible for the development of "plastic tooling" as a recognized production process, the National Society of Plastic Tooling was formed and Delmar Anderson, superintendent of production planning and tool design for the Buffalo warplane plants of Curtiss-Wright Corp., was elected president.

Thomas A. Herbert, superintendent of the plastic, plaster and foundry departments, Allentown plant, Consolidated-Vultee Aircraft Corp., was elected vice president. Harry W. Tompkins, Curtiss-Wright, Buffalo, was chosen secretary, while Charles H. Miller, Bell Aircraft Corp., also Buffalo, was elected treasurer.

LAY POSTWAR RAIL PLANS

VANCOUVER—Streamlining will be advanced on Canadian railroads after the war and equipment companies are now laying their plans for this, according to N. B. Walton, executive vice president, Canadian National Railways. Much of the recent development in plastics can be applied to railway purposes, he says, and experimentation on the use of radio-telephone communications on trains is in progress.

New box cars are being released from C.N.R. shops in fairly large quantities, and the Transcona shops at Winnipeg are building 200 new refrigerator cars.

Plan Labor-Management Show

WASHINGTON — The first National Labor-Management Exposition is scheduled for the Department of Commerce Auditorium, here, February 28 to March 11. The first four nights will be devoted to exclusive previews, open only to a specially invited list, and to exhibitors, their guests and representatives of the press. Prominent speakers will be heard.

The exposition will be open to the general public, 10 a.m. to 10 p.m., March 3 to 11.

A.I.E.E. Nominations Announced

NEW YORK—The national nominating committee of the American Institute of Electrical Engineers has nominated C. A. Powell, manager, Headquarters Engineering Depts., Westinghouse Electric & Mfg. Co. for election to the presidency at the election this spring. At the same time, P. L. Alger, staff assistant to vice president in charge of engineering, General Electric Co., was nominated a director. Candidates elected will assume office Aug. 1, 1944.

Flight Deck — Known throughout Lockheed Aircraft Corp. as the "USS Saratoga" because of its aircraft carrier appearance, the new moving inner wing assembly line suspends the wing between two overhead hand operated trucks on rails. It replaces the older wing line of 20 stationary stands, with wings moved by overhead cranes. Manhours have been cut 82.7, manpower requirements 50 percent

Names in the News

B. A. Graham has been appointed president and general manager of Chicago Flexible Shaft Co., Chicago, succeeding H. C. Wright who will remain active in the firm as chairman of the board. Mr. Graham was previously vice president and assistant general manager. He joined the company's sales division in 1924, becoming sales manager three years later, and was advanced to the vice presidency in 1935. **J. W. Lynch**, formerly second vice president, has been advanced to senior vice president and general plant manager.

Advanced at Chicago Flexible Shaft

B. A. GRAHAM

J. W. LYNCH

Ludlum Sales Chief

R. M. ALLEN

Kreston T. Sorensen has joined William Sellers & Co., Philadelphia, as assistant to the president. Recently Mr. Sorensen has been in charge of design of special weapons and material for the Ordnance Department. From 1939 until 1941 he was associated with Baldwin Locomotive Wks., Philadelphia.

A. J. Tigges has been appointed manager of consulting engineering for all divisions and subsidiaries of Baldwin Locomotive Wks., Philadelphia. Since 1923 Mr. Tigges has been associated with the engineering firm of Jackson & Moreland, Boston.

Martin J. Berlyn has become vice president in charge of engineering of American Bosch Corp., Springfield, Mass. He was formerly chief engineer and manager, diesel engine division of Dominion Engineering Wks., Montreal.

Russell M. Allen, formerly general manager of sales of Allegheny Ludlum Steel Corp., Pittsburgh, has become vice president in charge of sales. Mr. Allen has been associated with the company since 1920 when he was a production man in the mill. Later he was transferred to the sales department and has been general manager of sales for the past four years.

William J. Creighton has been made executive vice president of Jones & Laughlin Steel Corp., Pittsburgh; and **Adam J. Hazlett** has become general manager of sales. Mr. Creighton joined the organization in 1900 and became financial vice president in 1928. Mr. Hazlett became associated with J. & L. in 1938 as manager of strip and sheet sales. Prior to that he was connected with West Penn Steel Co. and with Eastern Rolling Mill Co.

Frank S. Spencer, formerly associated with General Electric Co., Lynn, Mass., has been appointed sales manager of the manufacturing division of Warren Brothers Roads Co., Cambridge, Mass.

W. S. Long, previously operations manager of United States Rubber Co., Los Angeles, has been named Pacific Coast sales manager of the company.

Bennett S. Chapple, Jr. has become associated with Firth-Sterling Steel Co., McKeesport, Pa., as assistant to the president. He was formerly assistant manager of sales of the New York district of Carnegie-Illinois Steel Corp. Previously Mr. Chapple was secretary and sales manager of the Insulated Steel Construction Co., Middletown, Ohio, and was for a time connected with the development department of American Rolling Mill Co., Middletown, Ohio.

Camille F. Poirier has joined Sperry Gyroscope Co., Brooklyn, N. Y., as industrial sales manager. Mr. Poirier was formerly vice president and general sales manager of Crocker Wheeler Electric Mfg. Co., Ampere, N. J., and prior to that he was New England manager for United States Electrical Motors Co. of Los Angeles.

Walter C. Ahlers, for a number of years assistant district manager of the Detroit office of SKF Industries, Inc., Philadelphia, has become district manager.

Harry K. Werst has been named vice president in charge of manufacturing of Elastic Stop Nut Corp. of America with plants in Union, N. J. and Lincoln, Neb. He was previously connected with Booz, Allen and Hamilton, management engineers of Chicago; and from 1933 to 1940 he was connected with Edw. G. Budd Mfg. Co., Philadelphia as superintendent of the stainless steel fabricating department.

Occupy New Posts at J. & L. Steel

W. J. CREIGHTON

ADAM J. HAZLETT

Stop Nut Co. Executive

HARRY K. WERST

Watson Retires Vice Presidency

James S. Watson has retired from the vice presidency of Link-Belt Co. after 50 years of service. He joined the Link-Belt Engineering Co., Philadelphia in 1893, and was elected a vice president of the company in 1929 and a member of the board of directors in 1937. Mr. Watson was chosen as head of the silent chain department in 1903, and built this new project into one of the important factors of the organization. He will continue as a member of the board.

James J. Nelson, general manager of Cramp Brass & Iron Foundries Div. of Baldwin Locomotive Wks., Philadelphia, has been advanced to vice president of the division. Mr. Nelson joined Cramp Brass & Iron Foundries Co. in 1932 as vice president and sales manager. When the company became affiliated with the Baldwin group, he continued as sales manager of the division, becoming general manager last year.

BUSINESS ITEMS

AC Spark Plug Div. of General Motors, Flint, Mich., has announced several changes in its regional sales offices. **Eugene B. Powell,** regional manager in Los Angeles, moves to Philadelphia to succeed **John C. Hines,** who will become a special assistant to the general sales manager. Mr. Powell is succeeded by **Harold L. Wardrop** as regional manager in Los Angeles; while **James F. Kingsley,** regional manager in Atlanta becomes New York manager. **William F. Parker,** former sales executive at Flint, takes Mr. Kingsley's place. **Edgar H. Francois** has been named manager in Chicago.

Lincoln Park Tool & Gage Co., Lincoln Park, Mich., has changed its corporate name to **Lincoln Park Industries, Inc.** At the same time the merger of **Carbur, Inc.,** maker of cemented carbide rotary files and cutting tools, with Lincoln has been announced. Future production will be handled as a departmental operation of Lincoln Park Industries.

Gray-Mills Co., Chicago, manufacturer of portable coolant systems, has moved to a new plant at 1948-52 Ridge Ave., Evanston, Ill.

S. D. Hicks & Son Co., Boston, Mass., fabricator of all types of equipment in sheet and plate metal, has established a branch office at 51 E. 42nd St., New York, N. Y.

Wyckoff Drawn Steel Co., Pittsburgh, has appointed **Jack E. Allen** as district sales representative in Buffalo and surrounding territory with offices at 525 Liberty Bank Bldg., Buffalo.

Keller Tool Co., Grand Haven, Mich., is the new name of William H. Keller, Inc. The company will continue to manufacture and market a line of pneumatic tools.

Harris B. Carlock, 1329 N. Highland Ave., Atlanta, Ga., has been appointed to represent **H. M. Harper Co.** in Tennessee, Mississippi, Alabama, Georgia, N. Carolina and S. Carolina. He will handle the entire line of Harper nonferrous and stainless bolts, nuts, screws, washers and other fastenings.

Amercoat Div. of American Pipe & Construction Co. has occupied new sales quarters at 4554 N. Broadway, Chicago. R. A. Glosgow, general sales manager, will make his headquarters there.

OBITUARIES

Charles E. Hahn, 53, general manager, Cincinnati Electrical Tool Co., subsidiary of R. K. LeBlond Machine Tool Co., Cincinnati, died suddenly of a heart attack at his home. He joined the company 20 years ago as a salesman and held the position of general manager for the past eight years.

Charles F. Niemann, 74, president and treasurer of Parkersburg Iron & Steel Co., Parkersburg, W. Va., died at his home in Pittsburgh.

William O. Vilter, president of Vilter Mfg. Co., Milwaukee, died in Columbia, Wis., at the age of 81. Mr. Vilter had been active in the company for over 62 years.

John A. Camm, president of Camm Baldes Machinery Co., Milwaukee, passed away recently.

Frederick A. Prahl, 62, a member of the research department of Weirton Steel Co., Weirton, W. Va., and former vice president in charge of manufacturing of Continental Can Co., New York, N. Y., passed away following a long illness.

Jacob D. Sherman, 62, manager of the New Jersey propeller unit plants for Curtiss-Wright Corp. died at his home a short time ago. Early in his career Mr. Sherman was superintendent of the Mitchell Lewis Machine Co. at Racine, Wis., and in 1912 became manager of the Illinois Tool Wks. in Chicago. Formerly he had been associated with Reynolds Spring Co., Jackson, Mich., and later with Willys-Overland Co. at Toledo.

James A. Nolan, 54, New York state representative of Carpenter Steel Co., Reading, Pa., died at Rochester, N. Y. He had been connected with the firm for 33 years.

MEETINGS

American Foundrymen's Assn. War production congress and show. Memorial Auditorium, Buffalo, N. Y. Apr. 25-28.

American Gas Assn. War conference. Hotel Seneca, Rochester, N. Y. Mar. 30-31.

American Gear Manufacturers Assn. Spring meeting. Westchester Country Club, Rye, N. Y. May 22-24.

American Iron & Steel Institute. Waldorf-Astoria Hotel, New York, N. Y. May 25.

American Management Assn. Production Div. Drake Hotel, Chicago, Ill. Apr. 19-20.

American Society of Mechanical Engineers. Spring meeting. The Tutwiler, Birmingham, Ala. Apr. 3-5.

American Society of Tool Engineers. Annual meeting. Bellevue Stratford Hotel, Philadelphia, Pa. Mar. 26-28.

National Electrical Manufacturers Assn. Spring meeting. Palmer House, Chicago, Ill. Apr. 24-27.

National Metal Trades Assn. Annual meeting. Biltmore Hotel, New York, N. Y. May 17-18.

Society of the Plastic Industry. Annual meeting. Edgewater Beach Hotel, Chicago, Ill. May 11-12.

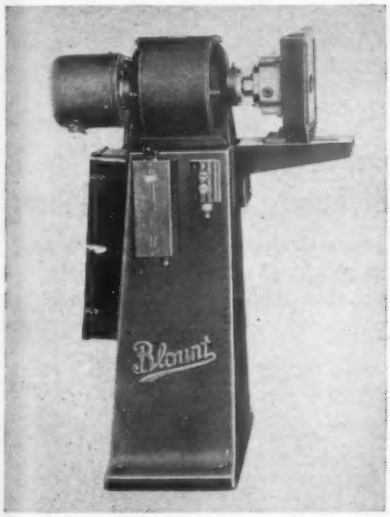
Westinghouse Machine Tool Forum. Wm. Penn Hotel, Pittsburgh. May 1-2.

Shop Equipment News

Blount A.C. Chucking Lathe For Finishing Small Parts

A pedestal type chucking lathe for alternating current has been produced by J. G. Blount Co., Everett 49, Mass. Model PW-20 is designed for quick finishing of small parts requiring varied tolerances. It measures 14×20¼ in. at the base and has an overall height of 47 in. Table length is 12 in. and its width is 6¼ in. Net weight of the machine is 490 lb.

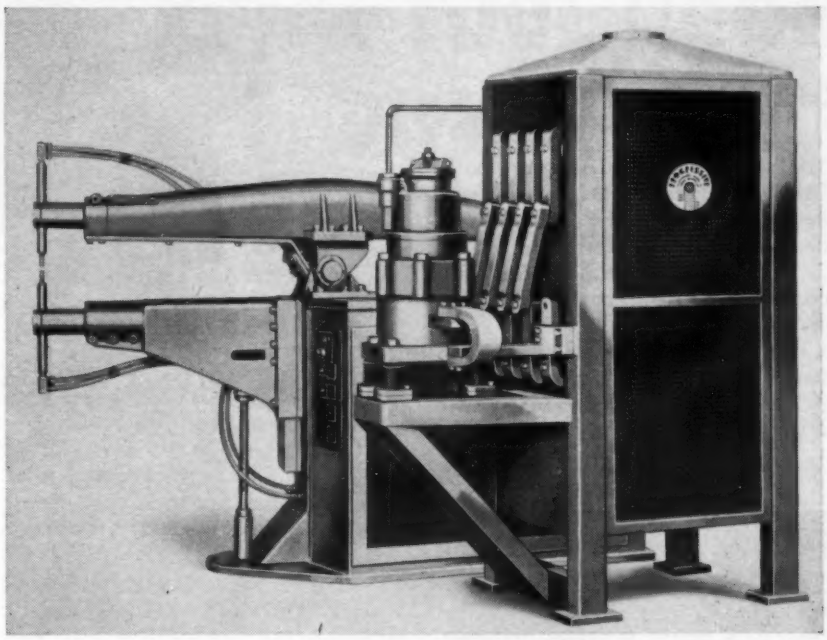
Machines may be furnished with varied electrical equipment. This particular unit is fitted with a solenoid brake for quick stopping. The lathe is also equipped with drum controller and starter with overload



Blount pedestal type chucking lathe

and low voltage release together with separate disconnect switch in one cabinet and remote pushbutton.

For finishing small parts which cannot be accommodated in the chuck, this lathe can be equipped with either handwheel draw-in mechanism together with various collet sizes ranging from ⅛ to ⅝ in. capacity, or with lever-operated draw-in arrangement. Two-speed motors 600 to 1,200, 900 to 1,800 r.p.m. and four-speed motors 600, 1,200, 1,800 and 3,600 r.p.m. can be supplied for this machine.



Progressive storage battery resistance welder

Progressive Develops Direct Current Resistance Welder Which Operates From a Storage Battery Power Supply

Welding current provided by storage batteries is the important feature of the newest direct current resistance welder manufactured by Progressive Welder Company, 3050 E. Outer Drive, Detroit 12, Mich. Installations have been made in the aircraft industry for welding aluminum assemblies. The use of batteries as stored energy sources did not require any radical redesign of existing welding machines.

Foremost in the advantages of this type of welder is the fact that it can be used in localities where power supply limitations prevent the use of other kinds of stored energy welders. The only requirements are that there be sufficient power to operate battery chargers. Other advantages claimed include: elimination of reactance losses between power supply and electrodes, less necessity for critical adjustments to get consistently good welds and simplicity of operation and maintenance.

Two developments made possible a practical battery operated welder. One was a battery—evolved for naval needs—which will withstand high repeated discharge rates and a contactor-controller which can control and interrupt enormous quantities of current without arcing.

At the welder a simple sequence welding control (non-synchronous) is required. This and an automatic pressure switch on the welder and a pedal-operated starter switch control the weld cycle. Control of actual current is by the contactor-controller. This unit can make and break contact of tens of thousands of d.c. amperes at low voltage without arcing and control the current through pressure adjustment. When pressure on the contactor drops to zero current automatically stops flowing.

The simplicity of the contactor-controller and elimination of transformers, synchronous heat controls and other equipment, make it pos-

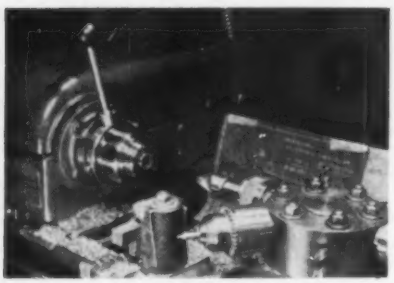
sible to maintain the battery welder with only a normal amount of mechanical skill, according to the makers. Normally, batteries require inspection and the addition of water about once a week.

Many types of Progressive resistance welders—rocker arm, pedestal and gun-types—may be used in combination with the storage battery power unit.

Calder Adds Line of Diamond Dressing and Hand Tools

Calder Ga diamond dressing tools have been added to the line of dressing equipment made by Calder Manufacturing Co., 628 North Prince St., Lancaster, Pa. The Calder Ga diamonds are available in all sizes and types of nibs.

The company also has available a line of diamond hand tools in six sizes, numbered from one to six inclusive.



Allison collet chuck

Allison Produces Collet Chuck With Circular Cam Mechanism

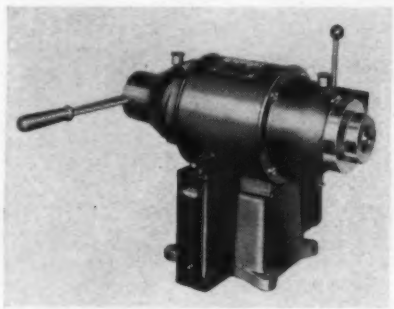
A collet chuck in two sizes has been made by Allison Tool & Engineering Co., 4031 Whittier Blvd., Los Angeles 23, Calif. One size is suited for 1½ in. eight thread spindles with ⅞ in. collet capacity, while the other takes 2½ in. spindles and under, with 1⅝ in. collet capacity.

A circular, low pressure cam is employed to activate the collet closing mechanism. The circular nature of the mechanism makes the chuck adaptable to polishing lathes and other high-speed spindles.

Little pressure and short travel distance are required on the operating handle when closing or opening the collet. This method makes the chuck adaptable to automatic screw machines also. The handle travels at right angles to the ways of the lathe bed, allowing the operator one free hand.

Schauer Speed Lathe Designed To Debur and Finish Parts

A general purpose speed lathe has been produced by Schauer Machine Co., 2063 Reading Road, Cincinnati, Ohio. It is designed for debur-



Schauer general purpose speed lathe

ring, lapping, polishing, or finishing small metal or plastic parts.

The machine is cooled by forced ventilation, with positive air filter to remove dust and abrasive particles. A fully inclosed-type switch eliminates danger of switch breakdown under adverse operating conditions. The control lever is fitted with a palm-fit, ball handle.

Youngstown heating tank

Youngstown Heating Tank Made in Portable Model

A portable heating tank, Model 20, is being built by Youngstown Miller Co., Sandusky, Ohio. It consists of an insulated heating tank equipped with electric heaters, a motor and pump for circulating the oil, thermostats for maintaining the oil temperature, electric controls and valves. The unit is mounted on casters.

Stationary tanks are available in a large range of sizes with or without mechanical agitation.

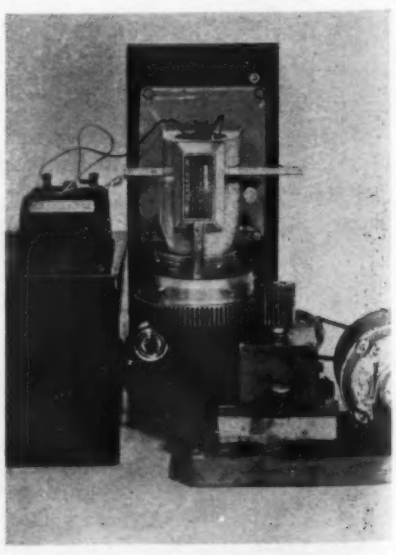
Features of the oil reclaiming line are included.

Arco Instrument Used to Test Flexibility, Adhesion And Scratch-Hardness of Paints on Metal Surfaces

Flexibility of paint films and other coatings after various degrees of exposure can be measured and recorded by the use of a testing device manufactured by Arco Co., Bessemer & Clarke Sts., Cleveland, Ohio.

The tests and measurements of flexibility are made on a machine known as the Arco Elongauge. It has been developed around a conventional Erichsen sheet metal testing machine, which was adapted to provide automatic controls and measurements for cycle testing. The end point of the test is automatically recorded on a galvanometer which has one terminal connected to the steel test panel and the other to a hypodermic needle in the well where one end is immersed in the water. When the paint film breaks, the water contacts the metal of the panel and causes the current to flow. This deflects the galvonometer which signals the end point of the test.

Scratch hardness and adhesion are measured by the Microknife. The load on the beam and the number of strokes required to wear through the film are the measure of scratch hardness. Used in connection with a movable platform, the Microknife becomes an adhesion measuring machine.



Arco paint film tester

Double Duty in YOUR TOOL ROOM

. . . with the Lodge & Shipley Tool Room Lathe, equipped with Universal Relieving Attachment . . .

All the usual jobs, PLUS the ability to do—end, internal, external, plain, angular, or spiral relieving work. Investigate these advantages.

END RELIEVING

PLAIN RELIEVING

GOOD LATHES ONLY — LATHES — SINCE 1892

Original Navy "E"
Awarded March 6, 1942

THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI, OHIO, U.S.A.

ENGINE TOOL ROOM AUTOMATIC OIL COUNTRY LATHES

Tocco Junior Induction Machine for Brazing, Annealing Provides Separate Mobile Work and Power Unit Features

A 7½ kw. output Tocco Junior induction machine which features a work unit separate from the power unit has been made available by Ohio Crankshaft Co., 3800 Harvard Ave., Cleveland, Ohio. The mobile top can be moved to facilitate shop operations. It is connected to the power unit by a cable that need not be limited as to length. This Tocco machine provides a wide range of induction heating for brazing, annealing, forming and hardening small parts. Its size permits its use in many ways.

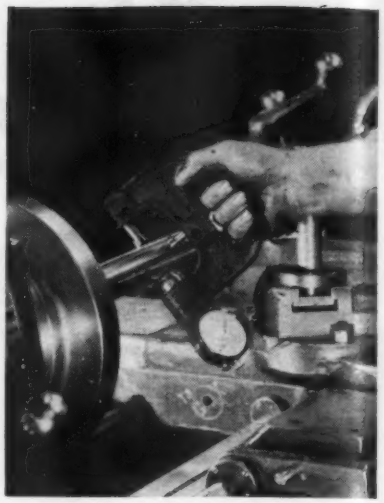
This unit is equipped with a vertical type 220 or 440 volt, 3 phase, 60 cycle motor generator set providing 9,600 cycles of high frequency power. The power, or lower unit, measures 30×36 in. and stands 30 in. high. It contains the motor generator, cycle controls, air filters and operating meters. The timer is located on the side of the cabinet as well as the field control switches.

The work, or upper, unit measures 20½×17×16⅜ in. high and houses the transformer, condensers and panel, to which work fixtures or inductor coils can be easily attached. A stop and start pushbutton with signal light is located in the upper right hand corner of the unit.

The mobile top can be transported about the shop and fitted into a production line without disturbing arrangement of the line. Power unit can be located under a bench or in a corner out of the way. Any length cable can be used for the connection.

For brazing, annealing or heating for forming, the two units need not be separated as operations can be carried on with a work bench adjacent. In hardening, quench water can be brought to the machine through an ordinary garden type hose, with drainage through the same medium.

Tocco Junior 7½ kw. induction machine



Sheffield dial indicator snap gage

Sheffield Improved Snap Gage Has Shockproof Dial Indicator

Sheffield Corp., Dayton, Ohio, has an improved dial indicator adjustable snap gage available in twelve models, covering a range up to 12 in. Comparator type checking can be made with this gage without removing work from the machine.

The shockproof indicator measures 2¼ in. in diameter and is graduated in tenths (0.0001 in.). When properly set the hand will make 1¼ in. revolution in either direction, the total range of the indicator being 0.025 in. Maximum range of 1 in. is provided by the adjustable anvil. It is spring-urged and operates independently of the indicator spindle with a constant pressure.

Construction of the lightweight frame permits a comfortable grip of the handle, and serrated plastic grips on each side of the frame also facilitate its use and insulate the gage against temperature of the operator's hands.

Le Maire Match-It Gear Chuck Provides Teeth Grip Feature

The Match-It gear chuck designed by Le Maire Tool & Manufacturing Co., Dearborn, Mich., features a method of gripping the gear teeth which is said to provide greater accuracy to holes bored or ground in the gears. The grippers of this chuck follow the same principle of construction as the gear itself. That is, the grippers contact the teeth of the gear in the same manner as the teeth contact those of the mating gears.

Many operations can be performed with the Match-It gear chuck, such

Small Size and Compact Design are Features of these Needle Bearings

REQUIRE LITTLE OR NO MORE SPACE THAN A PLAIN BEARING OF COMPARABLE RATING

One of the outstanding advantages of Torrington Needle Bearings is their exceptionally small size in relation to their unusually high radial load carrying capacity.

The use of a full complement of small diameter rollers within a single retaining raceway—the basic design principle of all Torrington Needle Bearings—has provided the advantage of *anti-friction operation* within space limits no larger than required for a sleeve or plain bushing.

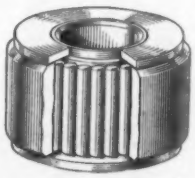
The small size which characterizes the Needle Bearing also contributes to efficiency and economy of product design in other important ways: it facilitates compact design; simplifies housing structures, frequently permits reduction in overall size; contributes to lighter weight; and through one or more of these advantages—makes for greater efficiency and lower cost.

Size Advantage in Newer Type Needle Bearings

As one new application led to another, modifications were made and new type Needle Bearings were developed by Torrington to meet new engineering requirements which were encountered, particularly in aircraft applications. For example, the AT Type, originally developed for use in conjunction with AN bolts, has a heavy, through-hardened outer race, a heavy hardened inner race, and is designed to give a maximum static non-brinell capacity equal to the sheer strength of the AN bolt. Another type was designed to adapt the Needle Bearing principle to cam-follower service...another for "x-tra capacity" load requirements... and so on until today Torrington provides a Needle Bearing to meet virtually any radial load requirement. The size ranges of the principle types are shown in the accompanying table. Additional information on other types and sizes will be found in our Needle Bearing Catalog, available on request.

TYPE DC

TYPE NCS



TYPE AT

TYPE RC

TYPE NEEDLE BEARING	MINIMUM SHAFT DIAMETER	MAXIMUM SHAFT DIAMETER
DC	.1875"	3.500"
NCS	.6250"	5.500"
AT*	.1900"	1.000"
RC	.2500**	1.500**

**Size range to fit Standard AN Bolts Nos. 3 to 16*

***Indicates OD of stud on cam-follower. Camroll diameters range from .6875" to 4.000".*

Importance of Size in Postwar Product Design

War-accelerated design of military equipment and material which has shown a definite trend toward "compactness" to save cargo space and lighter weight to facilitate air transport will continue to promote greater efficiency in the design of postwar products. The contributions which Needle Bearings can make in this direction are already well established in many fields. If you are planning new products or design improvements in old, it will pay you to investigate fully the advantages in the use of Needle Bearings. Our engineering department will welcome the opportunity to cooperate in developing designs or assist in the selection of the correct Needle Bearing for your requirements.

THE TORRINGTON COMPANY

Established 1866 • Torrington, Conn. • South Bend 21, Ind.

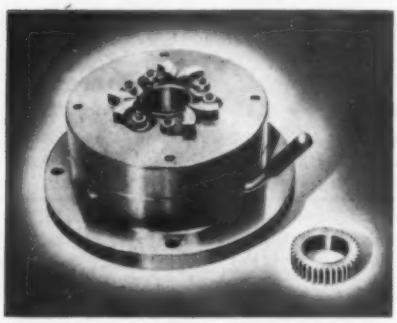
"Makers of Needle Bearings and Needle Bearing Rollers"

New York • Boston • Philadelphia • Detroit
Cleveland • Seattle • Chicago • San Francisco
Los Angeles • Toronto • London, England

TORRINGTON
NEEDLE BEARINGS

as finish boring, facing, counterboring; and grinding and finish shaping one set of teeth from another as in the case of countershaft or cluster gears. The chuck will accommodate both helical and spur-toothed gears, either external or internal.

It consists of two gripper plates, one stationary and the other movable. To grip a gear, one plate carrying a set of grippers rotates toward the



Le Maire Match It gear chuck

stationary plate causing the grippers to clamp each side of the tooth. Pressure is through the cross-section of the tooth and not through the center of the gear. It is said that distortion on delicate gears will not occur as easily by this method.

Rex Automatic Repeat Welder Features Electronic Control

Especially designed for use with complete electronic control, an automatic repeat welder of the press type is offered by Dyer Welder and Engineering Company, Kansas City 8, Mo.

Rex automatic repeat welder

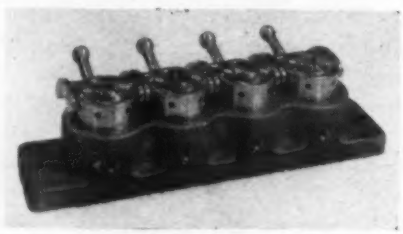
The welder permits high-speed precision welding on aluminum or stainless steel. The electronic control functions as a synchronous timer and phase shift heat control. It employs the ignition power tube contractor.

The welder is air operated and employs a new automatic repeat feature controlled by the operator with a foot pedal. The upper horn permits ready interchangeability from spot welding to projection welding through the use of an auxiliary lower horn with a platen.

All the operating mechanism is enclosed in the cabinet. Standard throat depth is 20 in. The unit is offered in capacities from 50 to 250 Kva. and is supplied in 220, 440 and 550 volt, 60 cycle, single phase. Power factor correction, with series capacitors, is available if desired.

Zagar Collet-Holding Fixture Permits Use of Multiple Units

A multiple collet-holding fixture is offered by Zagar Tool, Inc., 23880 Lakeland Blvd., Cleveland 17, Ohio. The unit consists of four holding fix-



Zagar multiple collet-holding fixture

tures in either 1 or 2 in. size. They can be mounted either parallel with or at right angles to the spindle. Two, three of four collets or multiples thereof can be used.

Center to center of collets is 3½ in. on the 1 in. fixture, and 5½ in. on the 2 in. fixture. Two fixtures can be staggered, however, reducing the distances ¼ in.

G. E. Improved Arc Welder Has Weather Resistant Motor

An improved Type WD-30 series of direct current single-operator arc welders has been developed by General Electric Co., Electric Welding Div., Schenectady, N. Y. The welder is equipped with two new control dials and a redesigned driving motor. The control dials permit the welding current to be preset without the aid of a volt ammeter, and the motor is built for resistance to weather when the machine is operated outdoors.

One of the control dials is calibrated in terms of electrode size, while the other dial indicates the

G. E. direct current arc welder

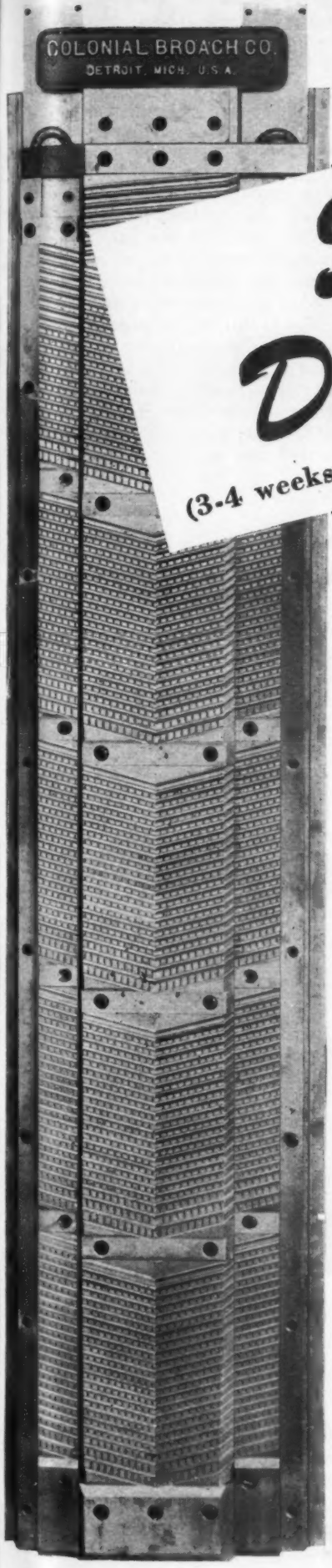
range of welding current available for use under these conditions. The operator presets the welding current by rotating a pointer to the amperage he wishes to use.

Enlarged intake openings for ventilating air keep the air velocity low enough to prevent rain and snow from being drawn in. A large baffle back of the openings prevents water from splashing into the motor.

Forss Produces Rivet Hammer With Offset or Grip Handle

A line of slow hitting aircraft riveting hammers is being produced by Forss Pneumatic Tool Co., 1827 Broadway, Rockford, Ill. The hammer is available in two sizes, with either the offset or conventional grip handle. Designated as HA-19, the smaller size has capacity of ⅛ and 5/32 in. rivets; while the larger size,

Forss riveting hammer



Short Deliveries

(3-4 weeks at time of closing of this issue)

on plain

FLAT BROACHES

from

Colonial

Due to the high production capacity for flat broach inserts and plain key-way broaches provided in Colonial's new plant, we are now able to make vastly quicker deliveries on broaches of this type.

Phone: PRospect 1600 or Write

colonial BROACH COMPANY
DETROIT 13, U.S.A.

Broaches *Broaching Machines - Broaching Equipment*

known as HA-39, has capacity of ¼ in. rivets.

The HA-19 with offset handle is 5 5/16 in. long overall, including the beehive retainer, and weighs 2 lb. 5 oz.; with the grip handle, the hammer measures 7⅞ in. long and weighs 2 lb., 7 oz.

With offset handle, the larger hammer measures 8 in. long and weighs 2 lb. 14 oz.; with grip handle it is 10 9/16 in. long, weighs 3 lb.

Standard equipment includes the beehive retainer and an adjustable air regulator. The nozzle takes standard Parker taper shank rivet sets 1⅝ in. long and 0.401 in. diameter.

Blount buffer and polisher

Blount Buffer and Polisher Is Built in Oerhang Type

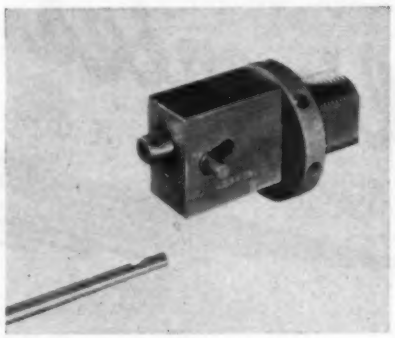
Model K.L. overhang type variable speed buffer and polisher has been produced by J. G. Blount Co., Everett, Mass. The machine is built in three sizes, 3, 5 and 7½ hp. It has spindle speeds ranging from 1,200 to 3,000 r.p.m. An indicator is provided to show revolutions of the spindle. Speed changes can be made while the motor is running.

The buffer is 48 in. high and has an overall spindle length of 55 21/32 in., with spindle extensions of 14½ in. on either side. The machine measures 33½×23½ in. at the base, and has a net weight of 985 lb.

American Broach Puller Made For Small Shank Broaches

For use in connection with small pull broaches having shanks ½ in. in diameter and smaller, American Broach & Machine Co., Div. of Sundstrand Machine Tool Co., Ann Arbor, Mich., has produced a round pin type broach puller. It is used for either manual or automatic operation.

When inserted into the head, the broach is pushed in to a point where the pin will automatically slip into the notch. The broach can be released by pushing the cross pin with the thumb and forefinger. If automatic release is desired, provision is made in a plunger just above the bore which receives the broach. This plunger is tapped and an adjusting screw is inserted and adjusted to come in contact with the reducing



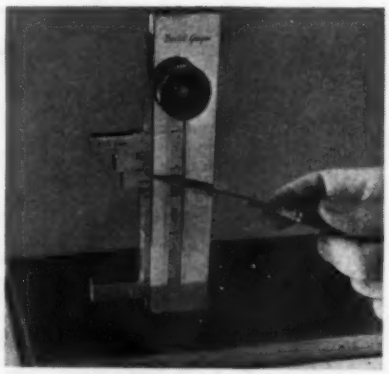
American broach puller

bushing, so that upon the return stroke of the broaching machine the pressure on the screw causes the plunger to recede. This releases the cross pulling pin, and the broach can be removed without touching the pull head.

When a permanently locked broach is required where it does not have to be removed from the pull head at the completion of each operation, the knock-off screw in the plunger is removed. In this case the broach is only withdrawn manually when it is to be removed from the machine.

DoAll Vernier Gage Blocks Provide Greater Size Range

DoAll vernier gage blocks, that extend the range of combinations of sizes which can be made with any set by combinations in steps of ten



DoAll vernier gage blocks

micro inches, have been produced by Continental Machines, Inc., 1301 Washington Ave. South, Minneapolis 4, Minn.

Gage blocks used in combination with the DoAll vernier gage can be set up to produce most all types of snap gages, height gages and depth gages. In combination with gage blocks a precision sine bar can be set to angles within 2 sec. of an arc. It is said that dimensions can be measured to within ten micro inches.

The DoAll vernier gage consists of two gage blocks having a precision taper on their mating faces. When the taper faces of these blocks are wrung together with their taper index marks coinciding, a gage block is formed that is 0.700 in. high. Total range of the vernier gage is ±0.00010.

Mead Flat Top Work Holder Holds Thin or Thick Work

For holding small flat work in the toolroom, Mead Specialties Co., 15 South Market St., Chicago, Ill., has produced the Flat Top work holder. This fixture will hold work which is flat on the bottom, varying in thickness from a few thousandths up to 2 in., and in area from the

Mead Flat Top work holder

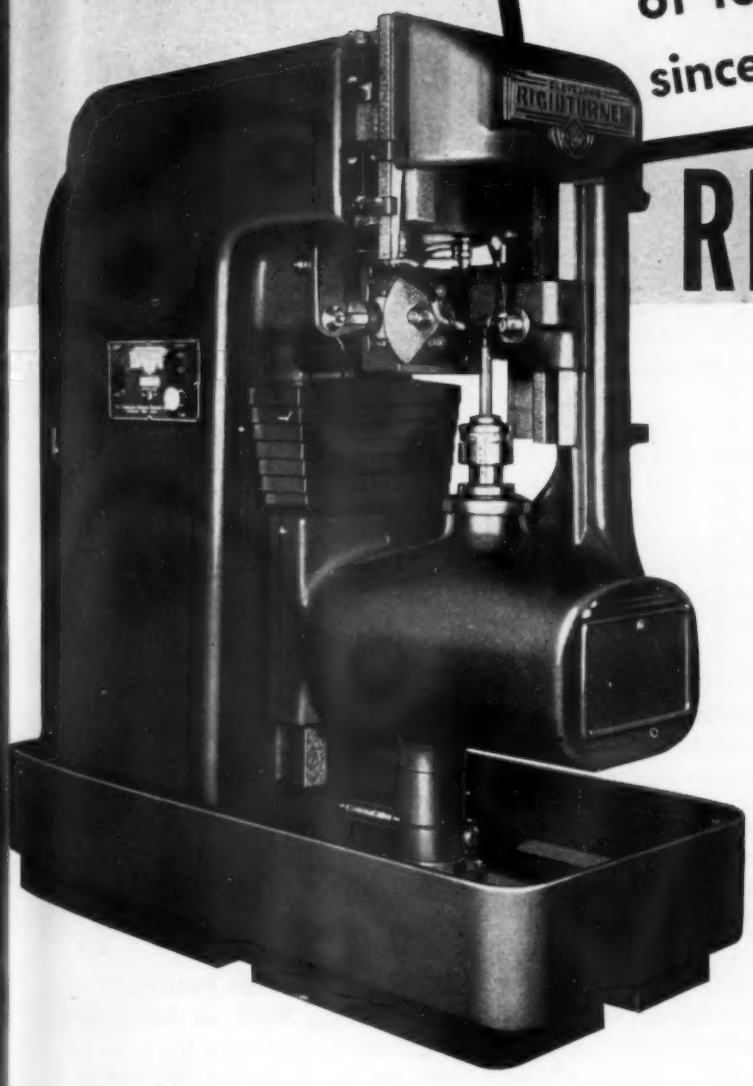
size of a dime up to several inches square.

In addition to drilling and tapping operations, the Flat Top is suited for many operations on small shapers and bench milling machines. One of the supporting plates is perforated and provided with three studs. This end of the fixture is

HOW'S THIS FOR A SCRAP RECORD?

THE WAYNE PUMP COMPANY reports a scrap record of less than ½ of 1% since they started using

RIGIDTURNERS



THIS IS A PHENOMENAL RECORD and demonstrates the economy of using the Rigidturners for accurate duplication multiple diameters

SIMPLICITY OF OPERATION

● The work advances past the cutter which is rotated in variable timed relation to produce various diameters. Operator merely loads machine, presses button and machine completes the operation and stops . . . ready for reloading.

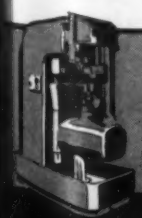
HIGH PRODUCTIVE CAPACITY

Capable of precision duplication on a high production basis the Rigidturner is meeting the urgent demands for all out war production today. And tomorrow when costs are an item to be reckoned with, Rigidturners can and will be quickly converted to peacetime operation due to their high productive capacity – precision – and savings they effect.

The Rigidturner is also built in the 8-Spindle Rotary model for mass production of multiple diameter work requiring close accuracy and faithful duplication.

Consult C.H. Engineers on your turning work now.

THIS BULLETIN tells how the Rigidturner operates—what work it will handle and how it can save you time and costs on turning multiple diameter work. Write for yours today.



The CLEVELAND HOBBING MACHINE Company

General Offices:
1311 CHARDON ROAD
CLEVELAND 17, OHIO

Chicago Office:
624 S. MICHIGAN AVE.
CHICAGO 5, ILLINOIS

BUILDERS OF RIGIDHOBBERS AND RIGIDTURNERS

used for milling and shaping work. Two studs are set in position to locate the back of the work, and the third is set at the end to support the work against the pressure of the cutting tool. Adjustment for work thickness is made by turning knurled head of the ball-joint stud.

Bridgeport Shaping Attachment Can Be Placed at All Angles

The Bridgeport vertical shaping attachment has been produced by Bridgeport Machines, Inc., 52 Remer St., Bridgeport 6, Conn. It can be mounted on the Bridgeport turret

Bridgeport vertical shaping attachment

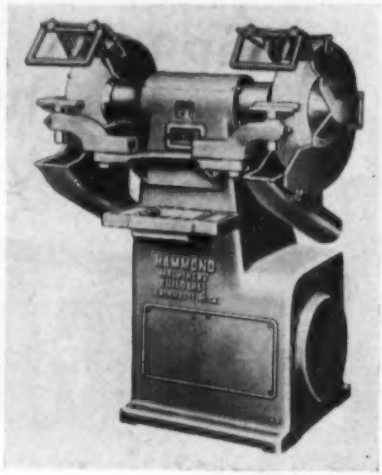
miller as well as on other types of vertical and horizontal milling machines. Any stroke from 0 to 4 in. in ⅛ in. steps is available.

This attachment can be set at all angles so that large dies can be relieved without the use of a rotary table. It is provided with a square ram with gib adjustment for wear take-up. Six speeds give 70, 100, 145, 205, 295 and 420 strokes per min.

Hammond Magnesium Grinders Have Direct Exhaust Outlets

Hammond 10, 12 and 14 in. grinders, Series RW, have been made with heavy plate wheel guards for magnesium grinding. They are built by Hammond Machinery Builders, Inc., 1618 Douglas Ave., Kalamazoo, Mich. The guards have direct exhaust outlets for connection to dust collecting system. These machines are also equipped with explosion-proof electrical equipment. Other grinders in the Hammond line may be similarly equipped for magnesium grinding.

The RW series of grinders is provided with larger oversize spin-

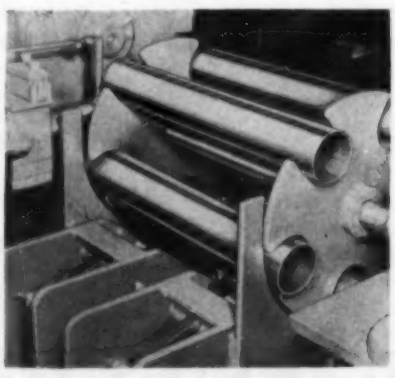


Hammond Series RW magnesium grinder

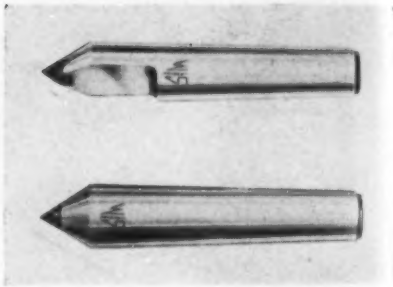
dles and bearings sealed against dust and grit. Design of the base pedestal permits the use of any standard make of 1, 2 or 3 hp. motor. Any desired spindle speed may be obtained through the multi-V-belt drive. Adjustable work rests are provided.

Pines Engineering Adds Feed Mechanism to its Profilers

Pines Engineering Company, Aurora, Ill., announces the addition of an automatic reel-type feed mechanism for handling tubes and rods in the self-centering type chucks on Pines profilers. The reel-feed has increased production of the profilers from 600 to 1,200 tubes per hour. It can be used with a chute and loaded by the operator at the cut-off machine, or loaded independently.



Pines feed mechanism

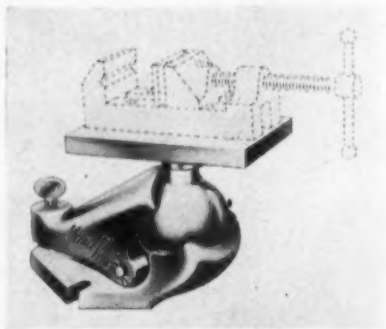


Wendt-Sonis lathe centers

Dendt-Sonis Lathe Centers Have Carbide Insert Extension

Carbide-tipped lathe centers and half centers made by Wendt-Sonis Co., Hannibal, Mo., are provided with an extension of the carbide insert into the shank of the tool, which is said to give longer service life. This extension is approximately equal to the exposed portion of the tip, allowing extra regrinds before the need of replacement. The lathe centers are stocked in standard tapers.

These tools are claimed to allow concentricity within 0.00002 or less.



Metro positioner

Metro-Vise Makes Positioner For Holding Work at Any Angle

The Metro positioner has been developed by Metro-Vise Co., 234 Stephenson Bldg., Detroit 2 Mich., for holding or clamping work during production operations. A vise or fixture may be bolted or fastened to the face-plate, permitting the word to be tilted to any angle desired.

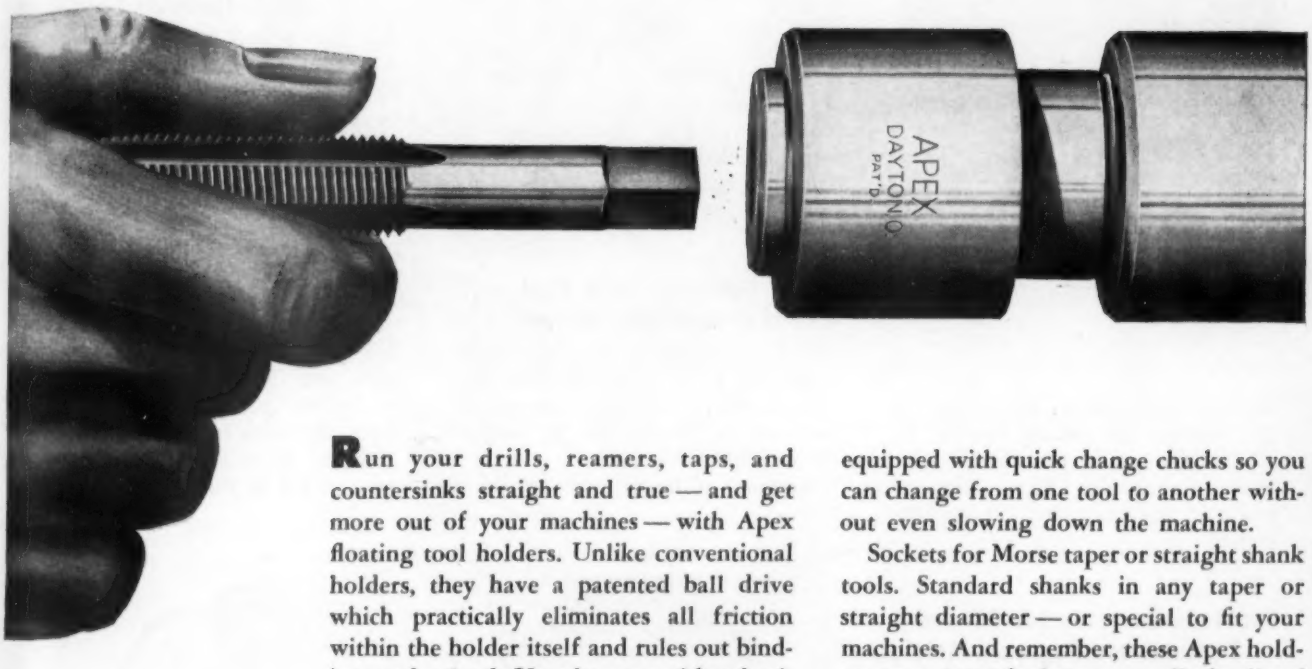
Two sizes are available, a 4-in. positioner measuring 7¼ in. high, with an 8×11 plate, weighing 58 lb.; and a 3-in. tool measuring 5¾ in. high, with a 4×6 in. table, weighing 30 lb.

This positioner operates on the ball and socket principle, and is released or locked in place by a turn of the thumbscrew.

Drill, Ream, Tap, Countersink

More Accurately

with Apex Floating Tool Holders Equipped with Drill Chuck Bottoms!



Run your drills, reamers, taps, and countersinks straight and true — and get more out of your machines — with Apex floating tool holders. Unlike conventional holders, they have a patented ball drive which practically eliminates all friction within the holder itself and rules out binding under load. Use them on either horizontal or vertical spindles. Buy them equipped with quick change chucks so you can change from one tool to another without even slowing down the machine.

Sockets for Morse taper or straight shank tools. Standard shanks in any taper or straight diameter — or special to fit your machines. And remember, these Apex holders are a part of a large, versatile family of production tools. Write for Catalog No. 14.

APEX

THE APEX MACHINE & TOOL CO., DAYTON, OHIO

Manufacturers of Safety Friction Tapping Chucks, Quick Change and Positive Drive Drill Chucks, Vertical Float Tapping Chucks, Parallel Floating Tool Holders, Power Bits for Phillips, Slotted Head and Clutch Head Screws, Hand Drivers for Phillips and Clutch Head Screws, Aircraft Universal Joints, Plain and Universal Joint Socket Wrenches.

Parts and Materials

Watchemoket Safety Goggle Made With Replaceable Lens

An all-plastic Model 7 safety goggle is offered by Watchemoket Optical Co., Providence 3, R.I. The one-piece replaceable lens is made of shat-

Watchemoket safety goggle

terproof methacrylate, and is said to be resistant to pitting caused by sparks. The shield protects the eyes from every angle. Other styles are available for wear over prescription glasses.

Penetone Concentrates Offered To Clean and Degrease Metals

Penetone, for cleaning and degreasing metals and machinery, is being offered by the Penetone Co., Tenafly, N. J. It comes in two formulas: the standard product suitable for most applications including degreasing where the lighter types of oils and greases are used; and Penetone Senior, a stronger concentrate for use on heavy oils and caked-on greases.

It is said that Penetone contains nothing toxic or injurious to the skin and is non-inflammable. For small parts, a bath consisting of a solution of one part of Penetone to ten parts of water is recommended. Either warm or cold solution may be used for the light-bodied oils. The heavier oils require a solution warmed to about 180 F.

Another Penetone product, known as Major, is suited for heavy-duty degreasing. This concentrate is combined in the ratio of 1:7 with kerosene for certain purposes, and in the same ratio with water for other uses.

Permaloy Alloy Provides Rigid Mounting for Diamonds

Permaloy, an alloy for mounting or setting diamonds in tools, has been developed by E. Karelsen, Inc., 125 West 45 St., New York, N. Y. It is said that by the use of Permaloy diamonds are held rigidly indefinitely, irrespective of the heat when the tools are used or the treatment to which the tool is subjected, and that diamonds can be reset without being ruined.

Littell Powertilt Wire Reel Automatically Elevates Coil

The Powertilt wire reel has been designed by F. J. Littell Machine Co., 4169 Ravenswood Ave., Chicago, Ill. Coils up to 250 lbs. can be handled on this equipment.

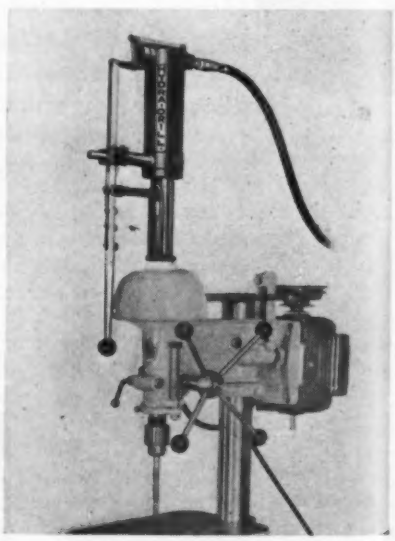
Loading of the coil is accomplished by lowering the center drum and rolling the coil onto the reel. This wire reel elevates the coil automatically to the working level. A turn of the control lever causes the motor to start and elevate the reel. When it reaches upright position, the motor stops. A slight push against the coil centers it, and the drop center is locked by throwing over a U-shaped bar. Any standard 1/3 hp., 1,725 r.p.m. motor is used to operate this reel.

Hydra-Drill Power Feed Has Adjustable Feed Rate

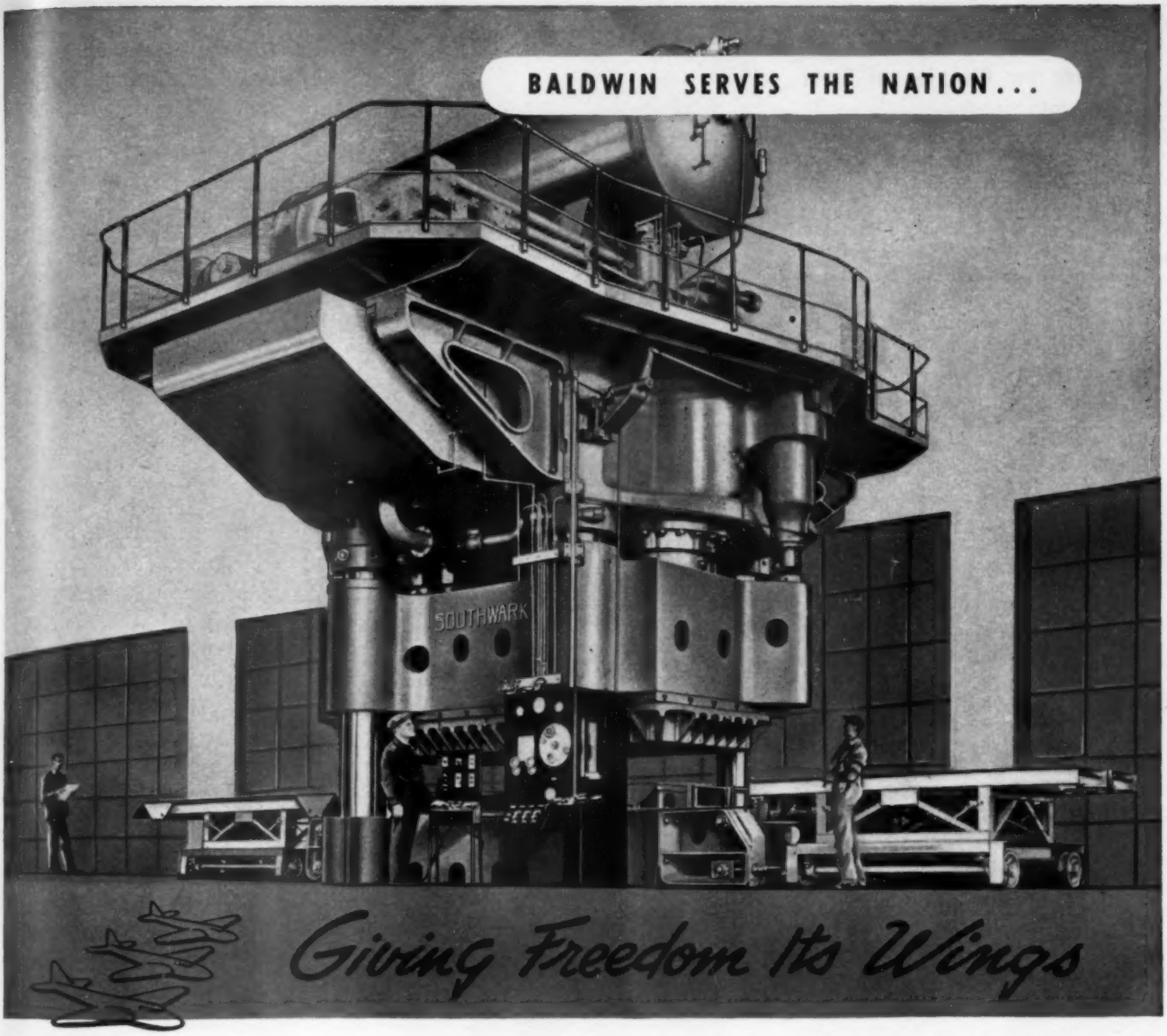
The Hydra-Drill power feed for all drill presses is being made by General Pacific Corp., 1800 South Hooper Ave., Los Angeles 21, Calif. Powered by air, this tool is designed to automatically operate a drill press so that the hand feed, while it can be used for individual operations, is unnecessary for fast production work.

Adjustable stops permit accurate adjustment for all drill press operations on any type of material or parts. This tool has an infinite range of feed, and the feed rate is adjustable to suit the particular drilling operation. A safety feature, consisting of a finger tip control, permits immediate release of the automatic feed.

Littell Powertilt wire reel



Hydra-Drill power feed



When the astronomical quota on U. S. plane production was set, aircraft manufacturers needed special presses, as quick as *yesterday*.

Fortunately, Baldwin didn't have to stop and learn *how* to build such equipment; 30 years of experience in building thousands upon thousands of presses took care of that. Manufacturers told what they wanted the presses to do . . . and Baldwin built them to do it.

You may have some production problems . . . current or post-war . . . that the right press could solve better than anything else. If so, the same Baldwin brains that served the aircraft industry are ready to serve you. Baldwin Southwark Division, The Baldwin Locomotive Works, Philadelphia, Pennsylvania, U. S. A. Pacific Coast Representative: The Pelton Water Wheel Co., San Francisco, California. In Canada: United Steel Corp., Toronto.

BALDWIN
PRODUCTS

Hydraulic presses
Testing equipment
Steel forgings and castings
Diesel-electric locomotives
Diesel engines
Metal plate fabrication
Rolled steel rings
Bronze castings
Heavy machine work
Crane wheels
Bending rolls
Plate planers
Babbitt metal
Alloy iron castings
Briquetting presses

BLW THE BALDWIN GROUP

BALDWIN
SOUTHWARK
HYDRAULIC PRESSES

Enthone Alkali Cleaner Made for Cleaning of Steel

Cleaner 100 has been produced by Enthone Co., 442 Elm St., New Haven, Conn., for cleaning of steel. This alkali material is used in a concentration from 4 to 8 oz. per gal. in temperature range from 180 to 212 F. It is said to be best used anodically, but is also an effective immersion cleaner.

Cleaner 100 contains complex phosphates to solubilize any fatty acid soap that may form from greases and oils being cleaned. It is effective in soft and hard water, and is claimed not to form insoluble residues due to reaction with acids.

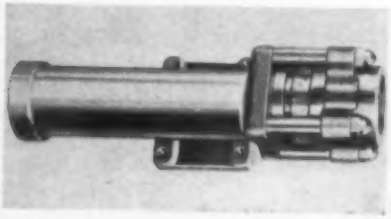
Rhodes Protection Padding For Sweat Bands and Goggles

A protection padding for goggles, chin straps, sweat bands and other headgear has been developed by James H. Rhodes & Co., 157 West Hubbard St., Chicago 10, Ill., incorporating the use of sponge clippings and chamois skins. Because of the oil tanning process to which the chamois skins are submitted, they do not dry hard after being exposed to perspiration but remain soft and pliable.

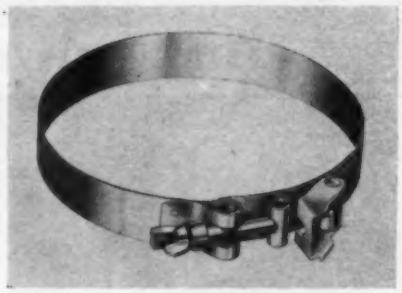
Hydraulic Precision Flogage Indicates Rate of Fluid Flow

A flow gage which continuously indicates the rate of fluid flow has been announced by Hydraulic Machinery, Inc., 12825 Ford Road, Dearborn, Mich. This unit has a capacity of 60 gal. per min. and measures 3 7/16× 13 15/16 in. overall, but is adaptable to any capacity.

The indicating dial is constructed as an impeller, rotary movement of which is resisted by a precision torsion bar. It is said that the Hy-Mac Flogage is insensitive to changes in fluid viscosity, temperature or pressure. An adjustment is provided to permit measurement of the flow rate for fluids of different specific gravities.



Hy-Mac Flogage

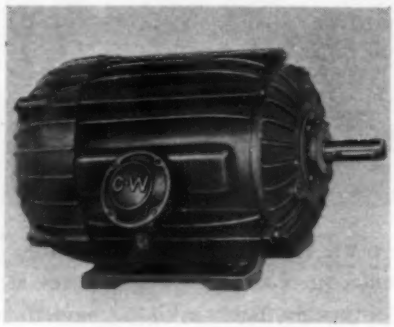


Marmon Quick-Coupler clamp

Marmon Quick-Coupler Clamp Provided With Snap-On Latch

The Quick-Coupler clamp designed by Marmon Products Co., 940 West Redondo Blvd., Inglewood, Calif., combines a snap-on latch with the full adjustment of a standard clamp. The device is particularly suited for handling removable equipment such as duct sections and fire extinguishers.

This clamp is available in all sizes, in aluminum alloy and stainless steel, and in shapes to fit convex surfaces. It can be furnished also with self-locking, plain hex or wing nuts.



Crocker-Wheeler Sealedpower motor

Crocker-Wheeler Motor Suited For Dust-Laden Atmospheres

Crocker-Wheeler Div., Joshua Hendy Iron Works, Ampere, N. J., has available a Sealedpower corrosion-resistant motor which is suitable for operation in atmospheres containing dusts, corrosive vapors or gases, and excessive moisture. This motor can be supplied in sizes from 1 to 15 hp., for operation from any polyphase power supply.

The Sealedpower unit is of the totally inclosed, fan-cooled type. Each coil is indivdually sealed against moisture, fumes, dust and vapor by the vacuum impregnation process. It is said that all exposed parts are largely acid and alkaline resistant.

Hanson-Van Winkle-Munning Offers Zinc Plating Solution

A zinc plating solution has been developed by Hanson-Van Winkle-Munning Co., Matawan, N. J. S-B addition agent is used with a special alkaline solution for producing satin-bright to bright deposits, the degree of luster depending on choice of operating conditions.

In unagitated solutions the cathode current density range is from 10 to 45 amp. per sq. ft. Maximum brightness is obtained with the solution temperature maintained at 70 to 75 F. For full-bright finish the work is dipped in a ½ percent nitric acid solution.

S.B. deposits can be heat relieved, blackened, given phosphate coatings or any of the chromate film treatments. The deposits can also be soldered.

Duo-Safety Portable Ladder Folds to Small Dimensions

A lightweight ladder which folds together to a 3×3 in. bundle when not in use is being offered by Duo-Safety Ladder Corp., Oshkosh, Wis. A locking device holds the ladder rigid in the open position. Duo-Safety shoes are provided for safety while working on all types of surfaces. This ladder has been built to withstand hard usage.

Barrett-Cravens Multiduty die table

Barrett Multiduty Die Table Serves as Portable Work Bench

Bartlett-Gravens Co., 3250 West 30 St., Chicago, Ill., has produced the Multiduty die table which serves as a portable work bench, a die set separator and lifting table for storing,

Telechron Electric Timekeeper, Warren Telechron Co., Ashland, Mass.

The inside story of a clock

In the manufacture of this pre-war Timekeeper, many individual parts are made from brass. For example, the rotor units are produced from Free Cutting Brass Rod in an interesting high speed automatic operation which, using a five-turret lathe, counterbores, spots, drills, reams, forms and cuts off an endless stream of finished caps.

Revere Brass is used widely in the manufacture of watch and clock parts and in a wide variety of chronological and recording instruments such as fire alarm systems, telegraph mechanisms, ship chronometers, watchman call boxes, and the like.

In this particular manufacturing field, Revere offers a variety of tested materials such as Sheet, Strip and Roll Brass. Also Free Cutting Brass Rod in all standard sizes and shapes. Brass Sheet Stock is offered in various widths, gauges, lengths and tempers, in an infinite variety of combinations depending upon the alloy and characteristics required. Special finishes are available for many alloys and products.

• • •

While primarily engaged in supplying Sheet, Strip, Rod, Bar, Tube and other mill products, Revere is also prepared to furnish a considerable number of fabricated semi-finished materials and parts not only in copper and copper base alloys, but also in magnesium and aluminum. Its intricate die-pressed aluminum forgings, especially as utilized by the aviation industry, are a case in point. If you have unusual technical problems involving the use of any Revere products, we shall gladly give you the benefit of our knowledge. Address Executive Offices. No obligation, of course.

REVERE

COPPER AND BRASS INCORPORATED

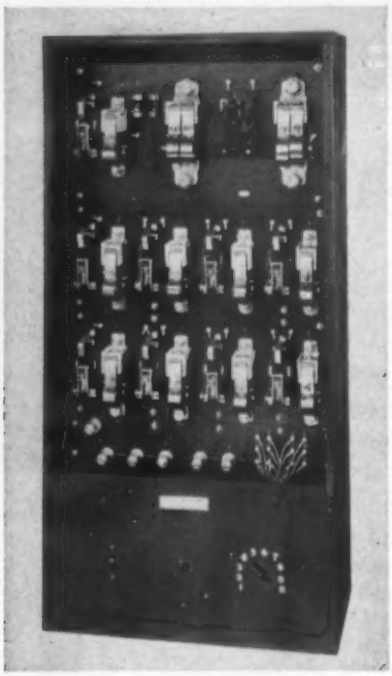
Founded by Paul Revere in 1801

Executive Offices: 230 Park Avenue, New York 17, N.Y.

moving and setting up dies, for supporting bars and sheets of steel and many other jobs. The table is offered in Style B-1, which handles dies up to 40 in. long, with table capacity of 3,000 lb., and with height adjustable from 24 to 40 in.; and Style B-2 designed to take dies up to 32 in. long, with table capacity of 2,000 lb. and same table height adjustment as Style B-1. Both models can be equipped with wheel brakes. A small crank-operated overhead hoist is incorporated for handling parts.

Zenith Voltage Selector Meets Many Current Uses

A magnetic voltage selector has been manufactured by Zenith Electric Co., 152 West Walton St., Chicago, Ill., for anodizing aluminum on alternating current. However, the unit has many other uses where like applications of current are required. The selector is designed for transferring in steps from 2 to 40 volts. It embodies automatic main magnetic contacts and automatic main switch contacts for nine positions at 2½ volt intervals.



Zenith voltage selector

The arrangement of the selector for transferring is such that the main contact opens before the secondary contact opens, and closes after the secondary contact is closed. Arcing is thus eliminated.

Oakite Powder Compound No. 86 For Cleaning Ferrous Metals

Oakite compound No. 86 has been produced by Oakite Products, Inc., 24 Thames St., New York 6, N. Y., for use in pressure type washers in cleaning and surface treatment of ferrous metals. The material is supplied in powder form.

This is an acid-type detergent which removes grease, oil and dirt from steel and iron parts, and is said to provide a base for firm adhesion of paint, lacquer and simlar types of organic finishes. This coating also acts as a rust preventive, protecting parts against rusting between operations.

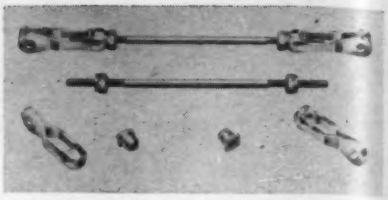
Chicago lift-front lens holder

Chicago Welding Lens Holder Provided with Lift Front

A lift-front lens holder for welding operators is offered by Chicago Eye Shield Co., 2362 Warren Blvd., Chicago 12, Ill. It is arranged so that it may be used in a semi-open position. This provides a clear view of the work while protecting the operator from flashes. The lens holder may also be opened a full 90 deg. Pockets and cavities have been eliminated from the outer surface, preventing the accumulation of slag at these points.

Bristol Fixture Measures Stove Dome Temperatures

The Bristol Co., Waterbury 91, Conn., has designed a fixture, adapting its radiation unit to the measurement of stove dome temperatures. The fixture consists of a gate valve to enable the unit to be removed for service and an air purge to cool the lens and unit. The radiation unit is used in conjunction with the Bristol Pyromaster potentiometer pyrometer



Poulsen & Nardon clevis rod end

P & N Socketype Clevis Rod End Available With Nut Terminal

A Socketype clevis rod end has been announced by Poulsen & Nardon, Inc., 2665 Leonis Blvd., Los Angeles 11, Calif. This rod used the P & N Socketype terminal. Rods are available in both fork and eye types in sizes 4-40, 8-32, 10-32, 12-24, ¼-28, 5/16-24 and ⅜-24.

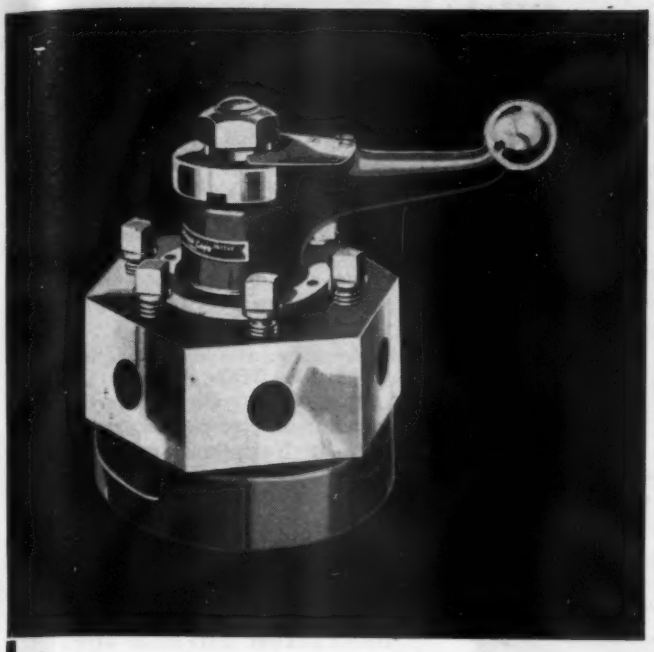
In place of the cable end a Socketnut has been developed to fit in the socket of the terminal. This nut is produced with right or left hand threads and with opposite sides slightly flattened to allow tightening with an end wrench. Thus it is possible with the Socketype terminals and with the use of a Socketnut or cable end to have either a cable or a rod end.

New Britain Spring Tester And Torque Wrench Units

Recoil pressure of springs compressed to any predetermined length can be measured or tested with the spring tester and torque wrench made by New Britain Machine Co., New Britain, Conn. Coil springs up to 7 in. in length and 2½ in. in diameter can be inspected.

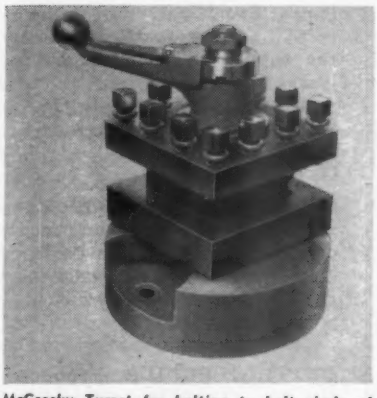
New Britain spring tester and wrench

Readings are taken on the scale of the torque wrench. This unit is 19 in. long and weighs 2 lb., while the spring tester weighs 12 lb.

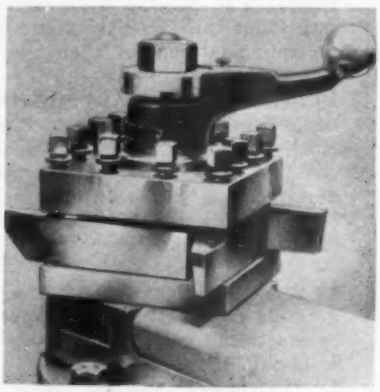


McCROSKY
Turret Tool Posts

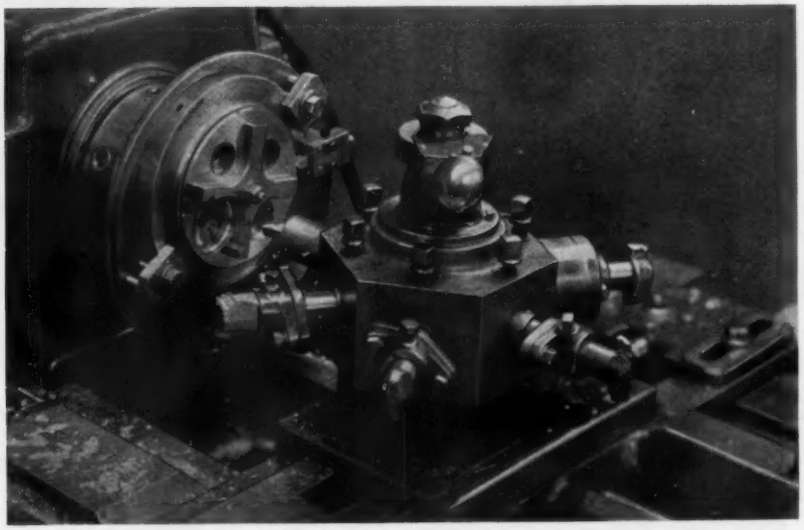
Have speeded war production in thousands of plants by extending the capacity of engine lathes to handle multiple operation jobs, and do them faster



McCrosky Turret for bolting to bolt circle of main slide. Three indexing positions are provided for each tool.



McCrosky Turret for mounting in T-Slot in place of ordinary tool post. Three indexing positions are provided for each tool.



McCrosky Hexagon Turret mounted on bolt circle of main slide. Six tools ready to be indexed into position without stopping lathe — Photo courtesy The Sidney Machine Tool Company

WAR-TIME pressure has tested and proved the ability of a McCrosky Turret to increase engine lathe versatility and output. It enables the operator to set up all the tools required for a complicated job, like the one shown above, before he starts his lathe, and to complete all the operations without stopping the spindle. Twenty-four lobes that mesh accurately and the cam-locked handle, exclusive McCrosky features, insure indexing accuracy and extreme rigidity under the heaviest cuts.

McCrosky Turrets are made in a wide variety of styles and sizes. To help select the turret for your lathe and job ask for Bulletin 16-E.

COST CUTTING TOOLS

EST 1904
McCROSKY
TOOL CORPORATION
MEADVILLE PA

SUPER ADJUSTABLE REAMERS
ADJUSTABLE BLOCK BORING BARS
JACK-LOCK MILLING CUTTERS
SPECIAL-PURPOSE CUTTING TOOLS
WIZARD QUICK-CHANGE CHUCKS
TURRET TOOL POSTS

Warehouse Service Keeps Pace With Wartime Developments in Alloys

The steel warehouses of the nation are charged with the responsibility of serving thousands of steel customers great and small. Any advancement in steel metallurgy becomes a problem or an opportunity for the warehouses. The advent of NE (National Emergency) Alloys, for instance, introduced new methods of evaluating alloy steels. Alloys may be accepted on the basis of their performance . . . rather than on the basis of analysis alone.

As the leading steel warehouse organization, Joseph T. Ryerson & Son, Inc., have contributed to the general acceptance of the new alloy steels and have been responsible in a large measure for the success of the program.

Among other features, this firm has inaugurated a new service for their alloy steel customers. The service embraces not only quality controls in the selection of steel for stocks, but, in addition, complete data is furnished on the heat treatment response for each lot of alloy steel shipped. This service is proving of real value to alloy steel users, who now can proceed with their heat treatment without worry about results.

New Data with Alloy Shipments

Time and money saving information is included on Ryerson Alloy Steel Reports furnished with each shipment of alloys. This report sheet gives you more complete data than has ever before been furnished with steel shipped from stock. A separate report is supplied for each heat and all heats are easily identified through color markings and heat symbols.

From large and complete stocks at Ryerson you can select the alloy steel best suited to your needs. Call your nearby Ryerson plant for quick action on alloys — or any other kind of steel you require.

Joseph T. Ryerson & Son, Inc. Plants at: Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

RYERSON

TRADE PUBLICATIONS

ABSENTEEISM War Advertising Council of the National Industrial Advertisers Assn., 100 East Ohio St., Chicago, Ill., in cooperation with the War Manpower Commission and the Office of War Information has prepared a folder designed to show advertisers how they can assist in curbing absenteeism.

BALL BEARING Booklet R, the 1944 edition of "Interchangeable Ball Bearings for Replacements" has been issued by New Departure Division of General Motors, Bristol, Conn. The book contains numerically arranged lists of ten competitive makes of ball bearings together with corresponding N. D. numbers. Other sections furnish statistical information.

BERYLLIUM COPPER SUPPLY A folder has been published by Instrument Specialties Co., Little Falls, N. J., setting forth the facts about the supply of beryllium copper, analyzes future prospects and describes methods this company has used to meet deliveries of springs of this metal.

COMPRESSOR DRIVE Low-speed synchronous motors and control for compressor drives are featured in a 4-page bulletin (GEA-4139) issued by the General Electric Co., Schenectady, N. Y.

CUTTING FLUIDS Products Bulletin No. 61 of The Pure Oil Co., 35 East Wacker Drive, Chicago, Ill., is devoted to an outline of test methods employed to develop and evaluate cutting fluids marketed by that firm and recommendations for their use.

ELECTRIC AIRCRAFT MOTORS A book available from The Emerson Electric Mfg. Co., 1824 Washington Ave., St. Louis 3, Mo., illustrates the development and testing, and gives specifications of its line of electric aircraft motors.

ELECTRONIC CONTROL The fundamentals and the various applications of electronic control are described in a 12-page bulletin (GEA-4126) issued by the General Electric Co., Schenectady, N. Y. The publication explains in clear, simplified language the fundamental principles of electronic tubes and their operation and lists the functions of eight of the more widely used industrial-type tubes.

FILING MACHINE Continental Machines, Inc., 1301 Washington Ave. South, Minneapolis 4, Minn., offers a new Doall band filing machine bulletin. It contains information on file broaching operations on metals, wood and plastics.

GAGES Pressure, vacuum and compound gages produced by Certified Gauge & Instrument Corp., 34-18 Northern Blvd., Long Island City, N. Y., are described and pictured in a pamphlet issued by that company.

HEAT-TREATING Surface Combustion, Toledo, Ohio, has issued a bulletin devoted to its carbottom furnaces. Typical applications are pictured and a conversion table for pressures is given.

HONES "Micromatic Marches On" is the title of a booklet published by Micromatic Hone Corp., Detroit, Mich., detailing in text and photographs the growth of that company and the development of its products.

HOSE REELS A folder issued by Schramm, Inc., West Chester, Pa., gives prices, specifications and illustrations of the use of its hose reels.

KNURLS Reed Small Tool Works, Worcester, Mass., has issued catalog No. 62, describing, picturing and listing in easy-order form its line of standard stock knurls.

LATHES A catalog insert (Bulletin D-15) of the J. G. Blount Co., Everett, Mass., describes, pictures and gives specifications of its a.c., 2 hp. motor headstock lathe which has eight speeds varying from 280 to 3450 r.p.m.

MANGANESE STEEL Bulletin No. 1243-CP published by American Brake Shoe Co., Chicago Heights, Ill., is devoted to the uses of manganese steel for the clay products industry.

MATERIAL HANDLING The Buda Co., Harvey, Ill., has issued a bulletin picturing and describing its model "B" Chore Boy industrial truck, showing a variety of uses and giving specifications.

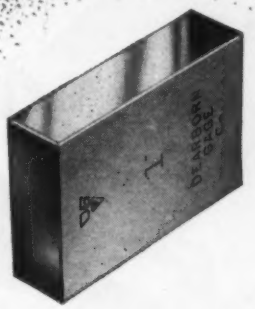
METAL WASHING MACHINE Bulletin No. 9 describing the American Tumbl-Spray Metal Washing Machine manufactured by American Foundry Eqpt. Co., 555 S. Byrkit St., Mishawaka, Ind., has been completely revised to incorporate recent design improvements.

MILLING VISE Bulletin CVH-60 prepared by The Bellows Co., 861 Tallmadge Ave., Akron, Ohio, describes the automatic milling machine vise of the same numerical designation developed by that firm.

OIL REMOVER An envelope stuffer prepared by the Waverly Petroleum Products Co., Drexel Bldg., Philadelphia 6, Pa., tells of the uses and value of Flix, "the speedy, safe, sanitary way to keep hands and arms oil-free," and for other industrial uses.

PLASTICS A 24-page, non-technical booklet covering all types of plastics, their uses and general information on

PROMPT DELIVERY ON GAGE BLOCKS



PROMPT DELIVERY can now be made on most Dearborn Gage Block W or Working Sets. These gage sets have a guaranteed tolerance of ± .000008 inch or fraction thereof. Their gaging surfaces are all chromium plated (an exclusive feature) for longer wear. Wire your order today or contact your nearest Dearborn Distributor.

W — Or "Working Sets" "W" accuracy is a guaranteed tolerance of ± .000008 inch per inch, or fraction thereof, of gage.

I — Or "Inspection Sets" "I" accuracy is a guaranteed tolerance of ±.000004 inch per inch, or fraction thereof, of gage.

L — Or "Laboratory Sets" "L" accuracy is a guaranteed tolerance of ± .000002 inch per inch, or fraction thereof, of gage.

DEARBORN GAGE CO. 22038 BEECH STREET DEARBORN, MICH.

Originators of Chromium Plated Gage Blocks

These TURNER gauges are helping to increase war production

Perhaps we can help you on some of your inspection problems by assisting you in designing special gauges. Quotations will be gladly submitted if accompanied by blue prints and complete specifications.

TURNER BROTHERS

TURNER GAUGE GRINDING COMPANY
2625 HILTON ROAD • • • • FERNDALE, MICH.

Something new!

TURNER
PLAST-O-LOCK GAUGE

Here's a plastic collet type gauge by Turner that is saving manufacturers money on their checking operations. Let us give you all the facts about this exclusive Turner idea in plug gauges. Write us today for descriptive literature.

the plastics industry has been released by The Richardson Company, Melrose Park, Ill. The two main groupings of plastics, Thermosetting and Thermoplastic, are described and illustrated.

REAMERS A pamphlet of Lavalle & Ide, Inc., Chicopee, Mass., gives prices and trade discount of its various sizes of ground flute reamers.

RUBBER MOUNTINGS A comprehensive booklet available from the Mechanical Goods division, The General Tire & Rubber Co., Wabash, Ind., describes its Silentbloc flexible rubber bearings, mounting and couplings for machinery and equipment in motion.

SAFETY The National Safety Council has completed two digests on: Protecting the Hair of Women Workers; and the Health and Safety Hazards and Precautionary Methods Involved in the use of Liquid Air.

SHARPENING A 16-page pocket size, 2 color technical manual (Bulletin HT-43) compiled to enable faster, more accurate sharpening of thread-milling cutters, gear hobs, etc., has been made available by Detroit Tap and Tool Co., 8432 Butler Ave., Detroit 11, Mich.

STANDARDS The American Standards Assn., 29 West 39 St., New York 18, N.Y., has published a new list of standards. It enumerates more than 600 standards, of which 64 have been approved or revised since the last price list was printed, April, 1943.

TECHNICAL TERMS A new 24-page booklet by the Development and Research division, The International Nickel Co., 67 Wall St., New York 5, N. Y., explains the practical meanings of technical terms used in measuring the mechanical properties of metals and alloys.

TESTING The United States Testing Co., 1941 Park Ave., Hoboken, N. J., has issued a booklet, "New World," in an attempt to give to industry a view of the part chemists, scientists, physicists and testing laboratories will play in the postwar world.

THREAD MILLING MACHINE The Model 40 automatic thread miller of The Lees-Bradner Co., Elmwood & Thomas Aves., Cleveland, Ohio, is described and pictured in detail in a brochure published by that firm.

TRAPS W. H. Nickolson & Co., 12 Oregon St., Wilkes-Barre, Pa., has issued bulletin No. 341 its junior model weight operated trap for automatically draining water and oil from compressed air. This model is intended for air or gas pressures up to 200 lbs.

VALVES Detailed engineering and application data of its line of high-speed motorized valves for on-off control of steam, air, oil, gas or chemical solutions is contained in a four-page

What will Users Want from POSTWAR Machine Tools?

4 BETTER FINISH

Among competing products, the one having the best machined finish almost always has the advantage—other things being nearly equal. It is a natural human trait to associate good finish with good quality.

And, experience with airplane engines has shown that finish is frequently important even when not visible. Airplane engine builders do much careful finishing on parts that are rarely seen . . because it has been found that finish is a powerful factor in eliminating fatigue cracks, hence fatigue failure.

By equipping machines with Vickers Hydromotive Controls, better finish can frequently be obtained without added cost and without extra operations. For example, smooth and uniform feeds can be secured regardless of variation in work resistance or hydraulic pressure. Vibration, backlash and override are usually easily eliminated . . . smooth reversals and constant cutting speeds on varying contours are also readily obtainable.

Better finish is only one of many advantages obtainable with Vickers Hydromotive Controls. Let Vickers Application Engineers discuss them with you.

VICKERS Incorporated

1410 OAKMAN BLVD. • DETROIT 32, MICHIGAN

Application Engineering Offices:

CHICAGO • CLEVELAND • DETROIT • LOS ANGELES • NEWARK
PHILADELPHIA • ROCKFORD • TULSA • WORCESTER

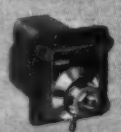
Representative of More than 5,000 Standardized VICKERS UNITS for Every Hydraulic Power and Control Function

CONSTANT DELIVERY PUMPS

CONTROL ASSEMBLIES

VARIABLE DELIVERY PUMPS

FLUID MOTORS



VOLUME CONTROLS

DIRECTIONAL CONTROLS

PRESSURE CONTROLS

WOOD & SPENCER

Woody Spencer says:

"The difference between a high grade tap and one of lesser quality may mean the difference between a job finished or a job spoiled. Insure the accuracy and precision of your tapping operations by specifying Wood & Spencer tapping equipment.

We will make recommendations from your blueprints.

Catalogs will be sent on request."

"THE RIGHT TAP AT THE RIGHT TIME"

The Wood & Spencer Company

Cleveland 3, Ohio

catalog (No. A3) issued by Automatic Temperature Control Co., 34 East Logan St., Philadelphia 44, Pa.

VIBRATION STUDY An eight-page reprint of a technical paper entitled "The Vibration Characteristics of 'Free-Free' Circularly Curved Bars" is offered by The Cooper-Bessemer Corp., 2511 Terminal Tower, Cleveland, Ohio.

WAR PRODUCTION SURVEY National Association of Manufacturers, 14 West 49 St., New York 20, N. Y. has released "Production for Victory, 1943," a survey of war production available in America, industry by industry.

WELDING Four ways to salvage, reclaim and conserve iron castings by electric arc welding are given in a twelve-page illustrated booklet published by C. E. Phillips & Co., 2750 Poplar St., Detroit 8, Mich.

WIRE CLOTH A technical reference book, "Industrial Wire Cloth, Engineering Data and Price List," is offered to industrial users of wire mesh and cloth by The C. O. Jelliff Mfg. Corp., Southport, Conn.

NEW BOOKS

TUNGSTEN—*By K. C. Li, chief engineer, and Chung Yu Wang, director of research, National Reconditioning Company, 325 pages. Published by Reinhold Publishing Corporation, 330 West 42 Street, New York 18, N. Y. $7.*

In the foreword of this technical volume one unexpectedly finds new evidence of the advantages of being on friendly terms with innkeepers' daughters. Mr. Li tells a fascinating story resulting from his search for tin deposits in southwestern China in 1911. In the lofty mountain range of Wuling he spent the night at a small inn and noticed the strange construction of the kitchen stove. Questioning the innkeeper's daughter developed the fact that the material came from a nearby outcropping which, on investigation, contained the purest wolframite with a high percentage of tungsten. Four years later, China was recognized as the world's largest producer of this element.

While tungsten is important to industry at all times, it is especially vital during wartime. This was found out in the first World War when Germany had quietly accumulated a stockpile of this metal, some of it from the Cornish mines in Great Britain. We know from our present war production the prominent part it has played in speeding up machining operations through its use in both high-speed steel and tungsten carbide.

Both the metallurgical and economic aspects of tungsten are covered in this

volume. The authors trace the processing of the metal from its ore deposits to its final application. They also tell just what tungsten has meant to industry and to the human race.

The volume is one of a series of scientific and technologic monographs published by arrangement with the Interallied Conference of Pure and Applied Chemistry and the American Chemical Society.

•

PLASTICS, SECOND EDITION—*By J. H. DuBois, Plastics Department, General Electric Company.* 435 *pages. Published by American Technical Society, Drexel Ave. at* 38 *Street, Chicago, Ill.* $3.75.

The fact that this volume had to be revised a year after its initial publication testifies to the rapid advance of the plastics industry. Wartime necessity for better products and faster production has stimulated the use of these materials. Some applications have been made in which plastics are substituted for rubber, or for non-ferrous metals, but many others reflect the place won by plastics on their own merits.

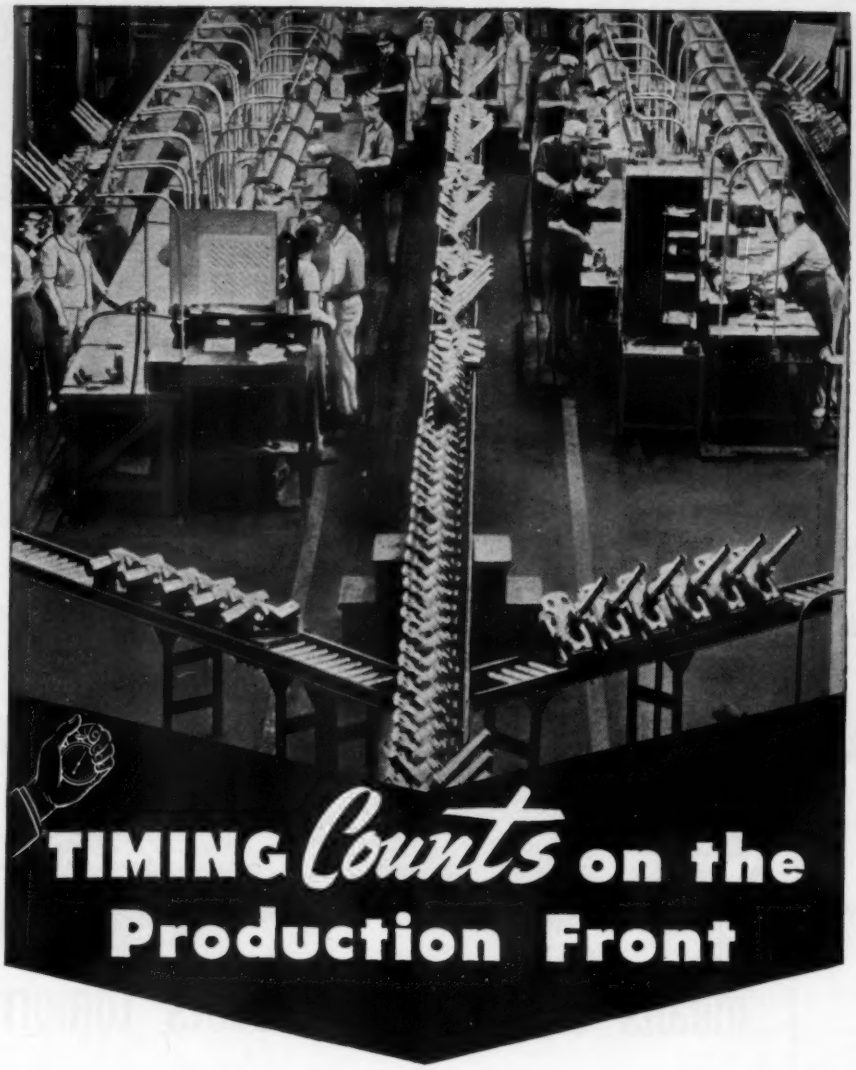
This second edition of Mr. DuBois' book takes into account these wartime changes and the improvements in technique that have resulted. The new edition also includes a chapter on vulcanized fiber because of the wide spread interest in this material. Otherwise the general presentation followed in the first edition is again used. The volume serves to supply basic information for users of plastics and for students being trained to face the problems of industry.

•

HAND TOOLS—*By Albert M. Wagener, instructor, Henry Ford Trade School, and Harland R. Arthur, supervisor of instruction for Naval Training School, Dearborn, Mich.* 174 *pages. Published by D. Van Nostrand Company,* 250 *Fourth Ave., New York, N. Y.* $1.75.

The purpose of this manual is to instruct the thousands of newcomers in the metal-working industry as to just what tools they must use and what these tools are for. The authors make no attempt to explain in detail how to use these tools because this would require more space and more instruction than is contemplated in this volume. In short, they have devised a manual which serves the same function to the shop employee as the caddie does to the golf player. The book helps the worker select the right tool without giving him the expert knowledge that an experienced craftsman possesses.

The authors have collected their material from their combined experience as instructors in the Henry Ford Trade School. The volume is well illustrated in order to best serve its primary function—tool identification.



. . . controlling the flow of material saves man-hours and makes certain that delivery schedules will be met

On the playing fields of sport—and on the field of battle — success depends on *timing*, rhythm of motion. Timing is a vital element in production, too.

Having the right material at the right place at the right time — just enough of it and not too much — is a characteristic of efficient production.

Keeping production synchronized — timed — involves planning all along the line, to relieve congestion at one point, speed up movement at another, to the end that goods will be produced with precision and speed, and at an economical cost.

Conveyor engineering, applied like Standard does it, accomplishes all these things. If you feel that *timing* could be improved in your plant — check with Standard.

"Conveyors by Standard" — Catalog No. AM-3 is yours for the asking. Why not write today?

Sales and Service in Principal Cities

STANDARD CONVEYOR COMPANY

General Offices:
North St. Paul, Minn.

★ ENGINEERED FOR FASTER PRODUCTION ★

means cutting down costs tomorrow!

TODAY, time is the world's most valuable commodity. Every time a plane is finished . . . every time a tank is turned out . . . we shorten the time between now and "V" Day.

And time will still be vital in the post-war industrial world. Production facilities will be tremendous. Sales will flow to those plants which can produce at low cost.

Here at Acme, our staff engineers are trained to save time for you today and cut costs for you tomorrow. Do you need a special tool? Acme can design and build it. Is there a problem in your production line? Acme engineers may have the answer to that problem.

Acme products, Acme engineers have helped many metal-working manufacturers with their production problems. Why not see what we can do for you?

FOR VICTORY
BUY
WAR BONDS
AND STAMPS

Army-Navy "E" Award received Jan. 12, 1943. White Star for continued high production achievement received Oct. 30, 1943.

ACME

Pattern and Tool Company, Inc.

DAYTON, OHIO

HEAT-TREATED ALUMINUM CASTINGS...PATTERNS...TOOLS...TOOL DESIGNING...PRODUCTION PROCESSING

What McCASKEY Control will do for you . .

Experiences in hundreds of plants, large and small, employing from a few to many thousands, prove that McCaskey Tool Crib Control . . .

1 Reduces crib inventories

2 Eliminates loss and theft of tools

3 Reduces breakage to an absolute minimum

4 Quickly locates all tools whether in the crib or in possession of workmen

5 Speeds crib service, reducing non-productive waiting time of workers and machines

6 Reduces tool clearance time of departing employees to a fraction of a minute

7 Definitely records employees' responsibility for tools, preventing disputes when tools are returned or workers quit

8 Is operated with minimum crib personnel; inexperienced attendants of either sex trained in about one shift

9 Is easily installed in busiest cribs and plants; initial investment and operating expense quickly repaid.

10 Provides for inspection and, when necessary, reconditioning of used tools before replaced in bins

11 Shows how long workmen retain tools; prevents keeping more than necessary at any time

12 Provides perpetual inventory and record of tool activity for elimination of obsolete tools and reduction of excessive inventories

13 Gives you facts justifying or denying necessity for tool purchases

14 Provides reliable data on life and comparative performance of brands and types of tools

15 Gives you accurate basis for allocation of tool expense to various departments

Why Install Tool Crib Control Now?

Engineers and operating men continue to drive themselves at top speed to get out production on essential jobs. Dependable subordinates are scarce. Why add the job of installing a new tool crib system now?

There are fifteen reasons in the column at the left. Consider only two.

Tools have been scarce, as everyone knows, even for war production. As a direct result, however, most tool inventories are unbalanced. Pressure has brought over-stocks of many items, although others still are dangerously low.

McCaskey Tool Control provides a simple means of determining actual production requirements. It will enable you to reduce your tool inventory with assurance that you know the exact number of each kind and size you need.

When you resume peace-time production you will not face the necessity of sacrificing excessive inventories of tools you cannot use. A Massachusetts plant that recently adopted McCaskey Control reduced tool purchases to such an extent that sources of supply were sure their contracts had been cut back.

Installations are being made by girls without previous factory experience aided by the suggestions of McCaskey industrial specialists. The job can be done now in your most active cribs. You will save now and later too.

●

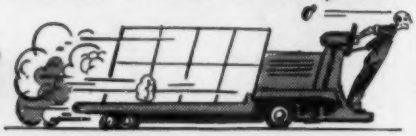
Let us have a representative explain how McCaskey Tool Control can be installed in the busiest cribs without disturbing production in the least — or send you factual reports on McCaskey savings in time and tools in several well-known plants.

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems Ltd., Galt, Ontario, Canada — *The McCaskey Register Co., Watford, England*

McCASKEY INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • MAINTENANCE • TOOLS • COSTS • PAYROLL

WHAT WAS THAT THAT JUST WENT BY? NOT A FOUR-STAR GENERAL BUT ANOTHER  LOAD OF WAR EQUIPMENT THAT WAS PUT TOGETHER IN RECORD TIME SINCE · · · THAT FAST-DRIVING RECESSED HEAD SCREW CAME ON THE JOB . . . . . IT'S PHILLIPS · · ·

THE ENGINEERED RECESS

Sure — the news is swell! But the war isn't over yet. The heat's still on — and production speed is as vital as ever.

One of the surest ways to get more speed in your assembly operations is to put Phillips Recessed Head Screws in the hands of your workers. Hundreds of plants all over the country have standardized on the Phillips screw — and the results have been spectacular. Driving speed has often been doubled. Vital man hours have been saved. Production has been greatly increased — thanks to the Phillips Recess which makes power or spiral driving practical.

Some advantages of Phillips Recessed Head Screws are listed here. Check them against slotted head screws — or any other type you may be using. You'll quickly see why it costs less to use screws with the Phillips Recessed Head.

TO MAKE WARTIME QUOTAS AND PEACETIME PROFITS

Faster Starting: Driver point automatically centers in the Phillips Recess . . . fits snugly. Fumbling, wobbly starts, slant driving are eliminated. Work is made trouble-proof for green hands.

Faster Driving: Spiral and power driving are made practical. Driver won't slip from recess to spoil material or injure worker. (Average time saving is 50%.)

Easier Driving: Turning power is fully utilized. Workers maintain speed without tiring.

Better Fastening: Screws are set-up uniformly tight, without burring or breaking of screw heads. The job is stronger, and the ornamental recess adds to appearance.

IDENTIFY IT!

Center corners of Phillips Recess are rounded . . . NOT square.

Bottom of Phillips Recess is nearly flat . . . NOT tapered to a sharp point.

PHILLIPS *Recessed Head* SCREWS

WOOD SCREWS · MACHINE SCREWS · SELF-TAPPING SCREWS · STOVE BOLTS

23 SOURCES

American Screw Co., Providence, R. I.
The Bristol Co., Waterbury, Conn.
Central Screw Co., Chicago, Ill.
Chandler Products Corp., Cleveland, Ohio
Continental Screw Co., New Bedford, Mass.
The Corbin Screw Corp., New Britain, Conn.
General Screw Mfg. Co., Chicago, Ill.
The H. M. Harper Co., Chicago, Ill.
International Screw Co., Detroit, Mich.
The Lamson & Sessions Co., Cleveland, Ohio
Milford Rivet and Machine Co., Milford, Conn.
The National Screw & Mfg. Co., Cleveland, Ohio
New England Screw Co., Keene, N. H.
The Charles Parker Co., Meriden, Conn.
Parker-Kalon Corp., New York, N. Y.
Pawtucket Screw Co., Pawtucket, R. I.
Pheoll Manufacturing Co., Chicago, Ill.
Reading Screw Co., Norristown, Pa.
Russell Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Manufacturing Co., Waterville, Conn.
Shakeproof Inc., Chicago, Ill.
The Southington Hardware Mfg. Co., Southington, Conn.
Whitney Screw Corp., Nashua, N. H.

...AND MOST WIDELY USED

Socket Head Cap Screw

Reasons for the "Unbrako's" rise to prominence and continued popularity over a period of many years are: exceptional strength and accuracy; uniformity; fine quality of steel used; neat appearance AND *the knurled head*, perhaps the "Unbrako's" greatest advantage because of its value as a production time-and-money-saver. Mechanics rightly call the "Unbrako" the "handiest screw in the shop" because they can turn the knurled head farther and faster by hand before a wrench is needed.

SIZES: No. 4 to 1½" DIAMETER.
WRITE FOR THE "UNBRAKO" CATALOG.

REG. U. S. PAT. OFF.

KNURLING of Socket Screws originated with "UNBRAKO" years ago.

UNBRAKO

STANDARD PRESSED STEEL CO.

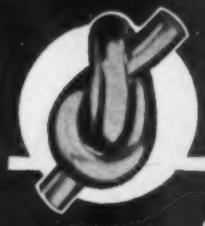
JENKINTOWN, PENNA., BOX 4 — BRANCHES: BOSTON · DETROIT · INDIANAPOLIS · CHICAGO · ST. LOUIS · SAN FRANCISCO

Over 40 Years in Business

Reduce Your Costs for Bigger Profits

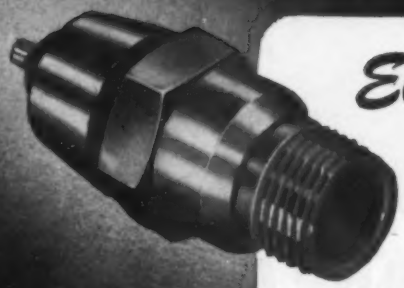
SPEED CASE STEEL

A LOW CARBON OPEN HEARTH PRODUCT



INCREASED PRODUCTION

- High Speed Machining
- Excellent Tool Life
- Minimum Machine Run-out



Eliminated Rejections

This Spark Plug Shell was machined on an Automatic at 302 S.F.P.M. with a bright, smooth finish. To eliminate rejections due to a crimping operation customer changed from B1113 to Speed Case X1515. Estimated Savings per ton of Steel Used $37.39.

If you wrote your own specifications for the ideal, all purpose, open hearth carburizing STEEL, it would be . . . SPEED CASE!

BUY WAR BONDS

Write for **SPEED CASE CATALOG.** *Actual shop records showing savings of 20 to 65%.*

Licensee for Eastern States

THE FITZSIMONS COMPANY

YOUNGSTOWN, OHIO

Licensor

MONARCH STEEL COMPANY

HAMMOND · INDIANAPOLIS · CHICAGO

PECKOVER'S LTD., Toronto, Canadian Distributor

HELPFUL INFORMATION FOR TRAINING NEW WORKERS ON MILLING OPERATIONS

A 16-page, illustrated, practical training course on milling. The beginner coming to the shop from non-industrial life or the candidate for up-grading from some simpler shop operation will find here background information about the machines and tools he will use, how they should be handled, what he can do with them.

Appearing originally in *American Machinist* as No. 3 in the series of special training sections on "Tools of Our Trade", the demand for this feature in reprint form clearly indicates the value placed upon it.

Send for the number of copies you need while they are still available. Price 10c each; less in lots of 500. Use coupon below.

MAIL COUPON TODAY!

AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

Please send me ..... copies of "How to Run a Milling Machine". Enclosed is $..... (in stamps, check, money order)

Name .....

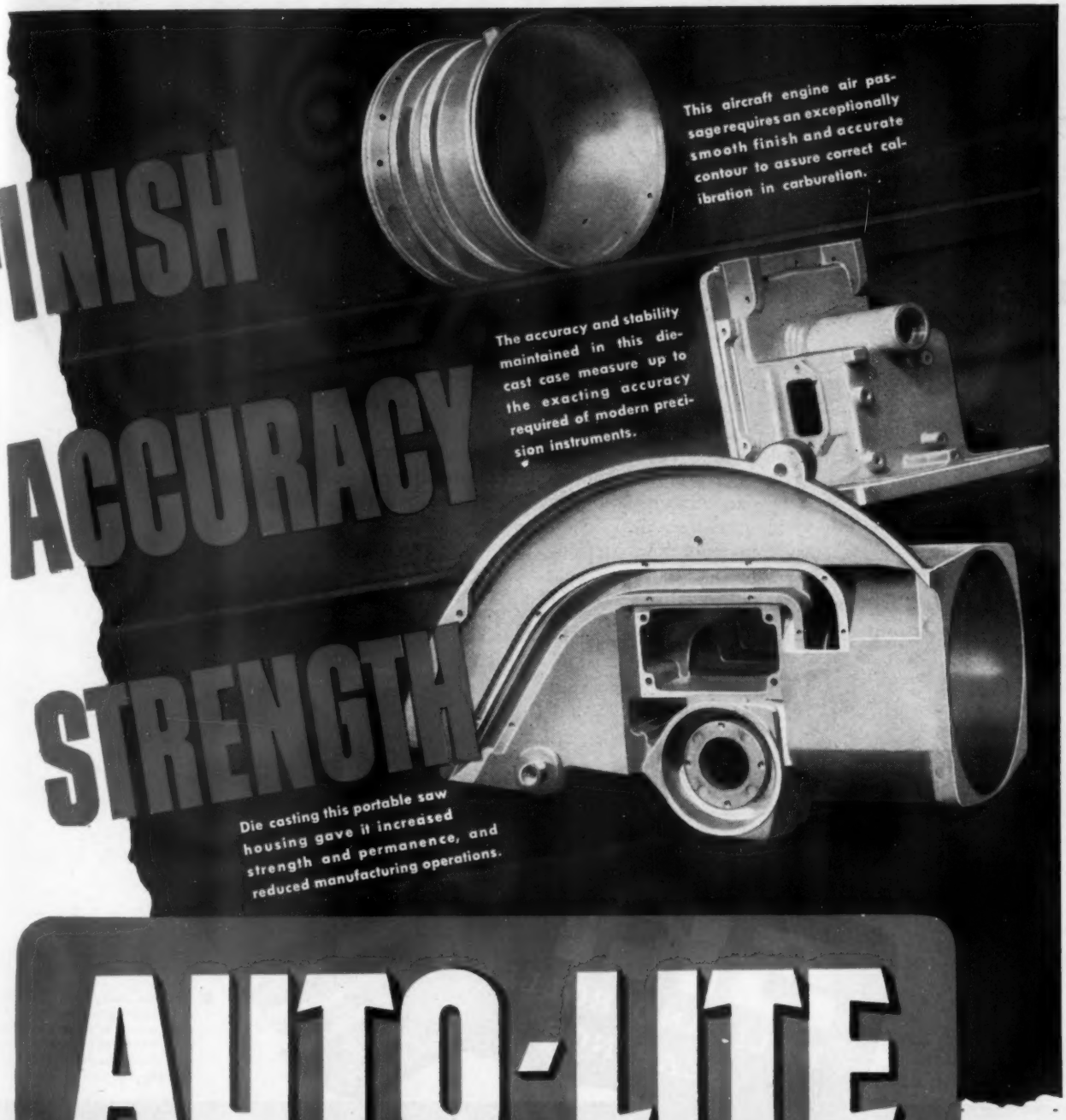
Title .....

Company .....

Address .....

.....

AMERICAN MACHINIST
330 W. 42 St., New York 18, N. Y.


FINISH
ACCURACY
STRENGTH
This aircraft engine air passage requires an exceptionally smooth finish and accurate contour to assure correct calibration in carburetion.
The accuracy and stability maintained in this die-cast case measure up to the exacting accuracy required of modern precision instruments.
Die casting this portable saw housing gave it increased strength and permanence, and reduced manufacturing operations.

AUTO-LITE
DIE CASTINGS

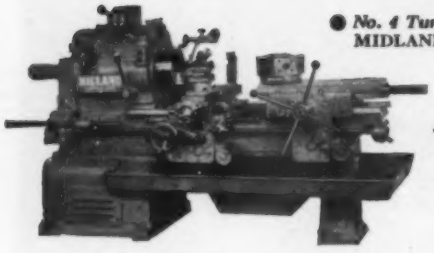
"Controlled Metals" give Auto-Lite Die Castings strength, accuracy and finish. Such thorough practice as spectographic analysis, metallographic studies, X-ray inspection and heat treating enables better control of metal for casting . . . avoids porosity . . . aids in elimination of defects through design change. Uniformity is maintained, for the complete run, once the desired standard is produced.

The Auto-Lite Die Casting plant combines under one roof complete facilities for die casting, machining and finishing either from zinc or aluminum. Auto-Lite's wide experience is available, within the limits of today's wartime demands, in adapting and producing die castings with the strength, accuracy and finish to meet your individual requirements. For information, write:

THE ELECTRIC AUTO-LITE COMPANY

600 S. Michigan, Chicago, 5, Illinois — *Alemite Die Casting Division*, Woodstock, Illinois — 723 New Center Bldg., Detroit, 2, Michigan

U WAR BONDS



● *No. 4 Turret Lathe built by* MIDLAND MACHINE CORP.

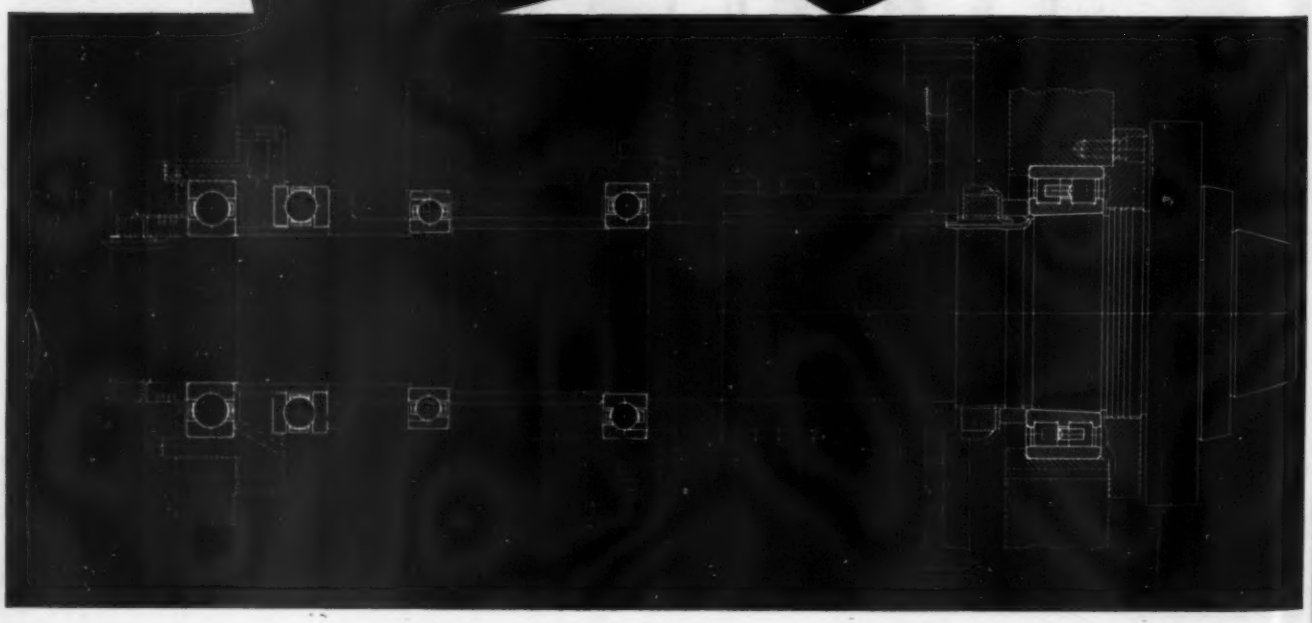
You *can tell*

THE DIFFERENCE ON SKF-EQUIPPED LATHES!

The moment this No. 4 Turret Lathe goes to work at 1200 r.p.m., so do SKF Bearings. As a result, there's *smoothness of operation* from a large number of staggered rollers in the SKF Cylindrical Roller Bearing located close to the spindle nose. There's *ability to obtain uniformity of work size* from bearings preloaded by correct principles. There are *rigidity* and *freedom from chatter* with bearings having low yield characteristics. There's *minimum operating temperature rise* resulting from low friction. Send for catalog, "SKF Machine Tool Spindle Bearings", that describes the advantages of SKF Bearings on machine tools of all kinds. 5523

SKF INDUSTRIES, INC., PHILADELPHIA 34, PENNA.

● *Spindle design by* SKF. *Besides the spindle,* SKF*'s are also used on idler gear, primary and intermediate shafts of the gear train in both the No. 4 and the No. 5.*



IN NEW PRODUCT DESIGN...

Checking an airplane engine part using a ROTAB *in connection with Meehanite cube and surface plate.*

MEEHANITE FOUNDRIES
Ready to Serve You — NOW

Allentown, Pa.	*Traylor Engineering Company*
Ansonia, Conn.	*Farrel-Birmingham Co., Inc.*
Birmingham, Ala.	*Continental Gin Co.*
Bridgewater, Mass.	*The Henry Perkins Co.*
Brooklyn, New York	*E. W. Bliss Company*
Buffalo, N. Y.	*Pohlman Foundry Co., Inc.*
Charleston, W. Va.	*Kanawha Manufacturing Co.*
Chattanooga, Tenn.	*Ross-Meehan Foundries*
Chicago, Ill.	*Greenlee Foundry Company*
Cincinnati, Ohio	*Cincinnati Grinders Incorporated*
Cincinnati, Ohio	*The Cincinnati Milling Machine Co.*
Cleveland, Ohio	*Fulton Foundry & Machine Co.*
Denver, Colo.	*The Stearns-Roger Mfg. Co.*
Detroit, Mich.	*Atlas Foundry Co.*
Flint, Mich.	*General Foundry & Mfg. Co.*
Hamilton, Ohio	*The Hamilton Foundry & Machine Co.*
Hamilton, Ontario	*Otis-Fensom Elevator Co., Ltd.*
Irvington, N. J.	*Barnett Foundry & Machine Co.*
Jeannette, Pa.	*Elliott Company*
Los Angeles, Calif.	*Kinney Iron Works*
Milwaukee, Wis.	*Koehring Company*
Mt. Vernon, O., Grove City, Pa.	*Cooper-Bessemer Corporation*
New York, N. Y., Mawah, N. J.	*The American Brake Shoe Co.*
Oakland, Calif.	*Vulcan Foundry Company*
Orillia, Ontario	*E. Long, Ltd.*
Philadelphia, Pa.	*H. W. Butterworth & Sons Co.*
Philadelphia, Pa.	*Florence Pipe Foundry & Machine Co.* (R. D. Wood Company, Selling Agents)
Phillipsburg, N. J.	*Warren Foundry & Pipe Corp.*
Pittsburgh, Pa.	*Rosedale Foundry & Machine Co.*
Portland, Oregon	*Crawford & Doherty Foundry Co.*
Rochester, N. Y.	*American Laundry Machinery Co.*
St. Louis, Mo.	*Banner Iron Works*
St. Paul, Minn.	*Valley Iron Works*
Seattle, Washington	*Washington Iron Works*
Spokane, Washington	*Washington Machinery & Supply Co.*

THE TREND IS TO MEEHANITE

A *new* development engineered and designed by Machine Products Corp., Detroit, is ROTAB, a flexible machining and checking device which permits complete machining or checking of all angles of a unit without disturbing the original clamped position.

When designing this equipment only Meehanite castings were considered because in Meehanite each design factor is known dependable and uniform. Modulus of elasticity, tensile strength (up to 55,000 lb. p.s.i. as cast) transverse strength, impact values, —all have been established by test, proved in service, and assured during manufacture by Meehanite process controls.

In planning your new product or redesigning an old one—investigate the economies and service available to you.

Write Engineering Service Department

MEEHANITE RESEARCH INSTITUTE
NEW ROCHELLE, N. Y.

Ask for Bulletin No. 12
"DESIGN WITH CONFIDENCE"

FROM SEEDS IN THESE

Will Sprout Better Peacetime Products

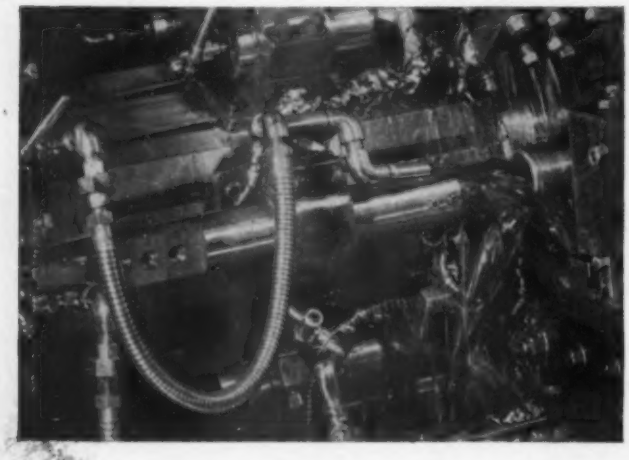
● Seeds in steel shells? Certainly! They're seeds of experience—from which will grow improvements in postwar products and economies in manufacture.

In producing thousands of tons of cold finished steels for ammunition of various sizes and styles —many of them developed during the present war—Union Drawn metallurgists have greatly increased their already unequalled knowledge of these steels.

Unusual demands have been made and met—both for quality and quantity—and each has added new experience in steel making, cold drawing and heat treating before and after machining.

At the same time, Union Drawn metallurgists and engineers have been busy in the plants where the steel bars are machined into shell parts.

Here, too, they have acquired valuable, new experience impossible to obtain quickly in any other way. They have continued their long, thorough study of the machinability of steels and machining practice. They have further assisted in set-ups, tool design, selection of most efficient feeds and speeds, and establishment of operating schedules.



All this experience on how to make and how best to use cold finished steels is yours—ready to plant as seeds in the improvement of your products and the development of new ones—if you will ask for it.

And—when you specify cold finished steels, take advantage of the *consistently* high machinability of Republic UNION COLD DRAWN STEELS to further assist you in manufacturing products to sell against keen competition.

UNION SUPERCUT (A.I.S.I. B1113) is the fastest-machining steel available today. UNION FREE CUT (A.I.S.I. B1112) is an advanced free-machining Bessemer Screw Steel. And UNION *free-machining* OPEN-HEARTH STEELS combine toughness with machinability.

Improvements in production and shipping facilities to meet urgent wartime demands now insure greater uniformity of product and better service than ever before.

REPUBLIC STEEL CORPORATION
Union Drawn Steel Division
Sales Offices • Massillon, Ohio
GENERAL OFFICES • • CLEVELAND 1, OHIO
Berger Manufacturing Division • Culvert Division
Niles Steel Products Division • Steel and Tubes Division
Truscon Steel Company
Export Department: Chrysler Building, New York 17, New York

Steel Shells

Republic

REPUBLIC STEEL — PRODUCTION FOR VICTORY

US

UNION COLD DRAWN STEELS

Free-Machining Bessemer, Open-Hearth and Electric Furnace Steels

Union Cold Drawn Special Sections

Union Cold Drawn and Ground Rounds; Turned and Polished Rounds; and Turned, Ground and Polished Rounds (Union Precision Shafting).

J. K. SMIT & SONS

157 Chambers St., New York, N. Y. 6400 Tireman Ave., Detroit, Mich.

INDUSTRIAL DIAMOND TOOLS

AISI **HY-TEN** SAE

NE

ALLOY STEELS FOR VICTORY

Scientifically selected to conserve critical alloys and meet the requirements of the AIRCRAFT, ORDNANCE, and MACHINE TOOL industries.

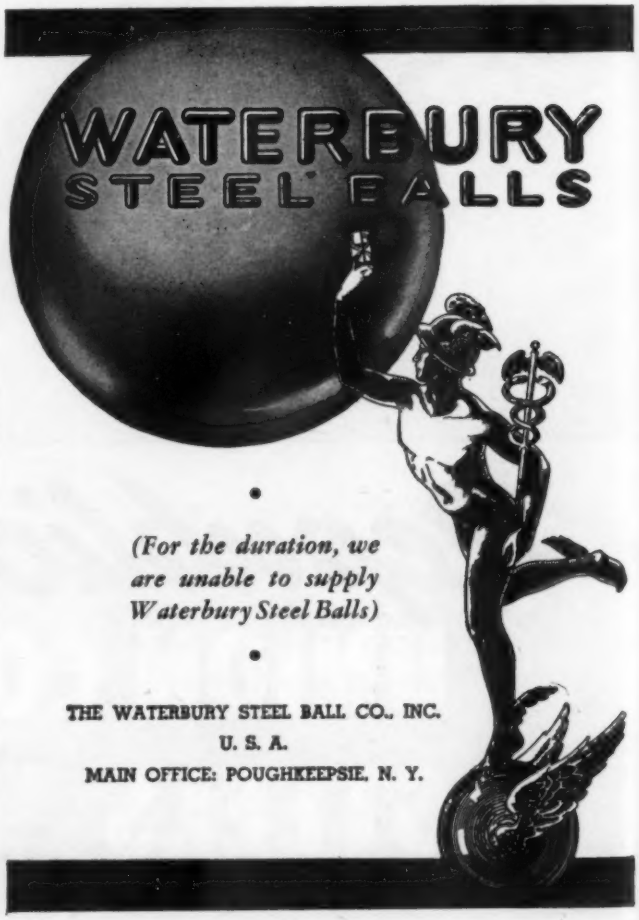
Complete "EARMARKED" stocks of Aircraft alloy steels at Buffalo and Detroit.

Wheelock, Lovejoy & Co., Inc.

138 Sidney Street
Cambridge, Mass.

Cleveland Chicago Newark Detroit Buffalo Cincinnati

WATERBURY STEEL BALLS



(For the duration, we are unable to supply Waterbury Steel Balls)

THE WATERBURY STEEL BALL CO., INC.
U. S. A.
MAIN OFFICE: POUGHKEEPSIE, N. Y.

BRAKE SHOE WARS ON WEAR

Announces research group to make vital parts last longer

For years, Brake Shoe in all of its divisions has been fighting to reduce losses caused by wear; heat, friction, impact, corrosion, abrasion and stress — wear from whatever cause.

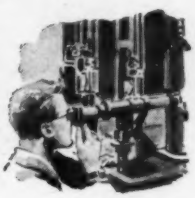
Now such activities have been augmented and strengthened by centralization of experimental engineering under the direction of a Research Group at Mahwah, N. J.

While activities of this Research Group cover a wide range of industrial problems, their immediate responsibility is to carry on relentless war on wear.

In nearly every machine there is a "punished" part — a place where wear is greatest.

Often a manufacturer's success depends upon his ability to improve that particular "punished" part.

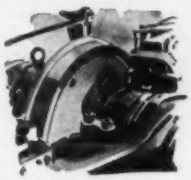
It is Brake Shoe's business to *know* the best material for each "punished" part and *how* to produce that material economically.



If existing materials are not good enough the Research Group endeavors to design better ones.

If design is faulty, Brake Shoe engineers can offer sound suggestions for changes.

Brake Shoe focuses *on one part* the effort that the manufacturer, for cost reasons, must spread over the *whole* machine.



The result? A better product . . . often at lower cost.

The resources of the Brake Shoe Research Group — unique we believe in this country — are available to manufacturers whose production calls for large runs of standardized parts.

Is Brake Shoe on Your Parts Source List?

Because many of the millions of parts produced by Brake Shoe for war have equally important peacetime uses, Brake Shoe will be ready for parts assignments in volume, the moment victory is won!

BRAKE SHOE'S RESEARCH GROUP

1. *Engineering Laboratory*
2. *Metallurgical Laboratory*
3. *Experimental Foundry*

AMERICAN **Brake Shoe** COMPANY

A parts source that may help you meet postwar competition

American Brake Shoe Company, 230 Park Ave., New York 17, N. Y.

8 DIVISIONS, 59 PLANTS SERVING INDUSTRY AND TRANSPORTATION

American Brakeblok Division ..... *Detroit, Mich.*	Kellogg Division ..... *Rochester, N. Y.*
Ramapo Ajax Division ..... *New York City*	American Forge Division ..... *Chicago, Ill.*
American Manganese Steel Division ..... *Chicago Heights, Ill.*	Southern Wheel Division ..... *New York City*
Brake Shoe and Castings Division ..... *New York City*	National Bearing Metals Corp. ..... *St. Louis, Mo.*

Production Executives agree:

"No Reconversion from American Phillips Screw-Driving

. . . from now on we'll need that Speed and Cost-Control more than ever before"

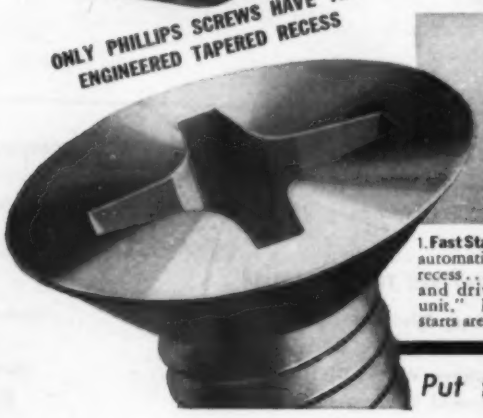
There's one sure thing in the plans of modern war plant executives . . . they'll never go back to the slow, slip-and-slash, high cost method of assembly with old-fashioned slotted head screws. They'll hold the gains they've made with American Phillips Screws which average better than 50% in assembly time, plus the elimination of rejected work and spoiled materials, thanks to the automatic alignment of the 4-winged Phillips Driver that stays with the tapered recess until the screw has been set up straight and tight.

A comparison of the cost of driving Phillips and Slotted Head Screws will show that it actually costs less to have the advantages of the Phillips Recess.

American brand of Phillips Recessed Head Screws are made under rigid laboratory check, and a unique system of piece inspection. Delivery service is maintained by high speed production. And engineering service is at *your* service on any special fastening problem.

AMERICAN SCREW COMPANY
PROVIDENCE, RHODE ISLAND

Chicago: 589 E. Illinois Street *Detroit:* 502 Stephenson Building



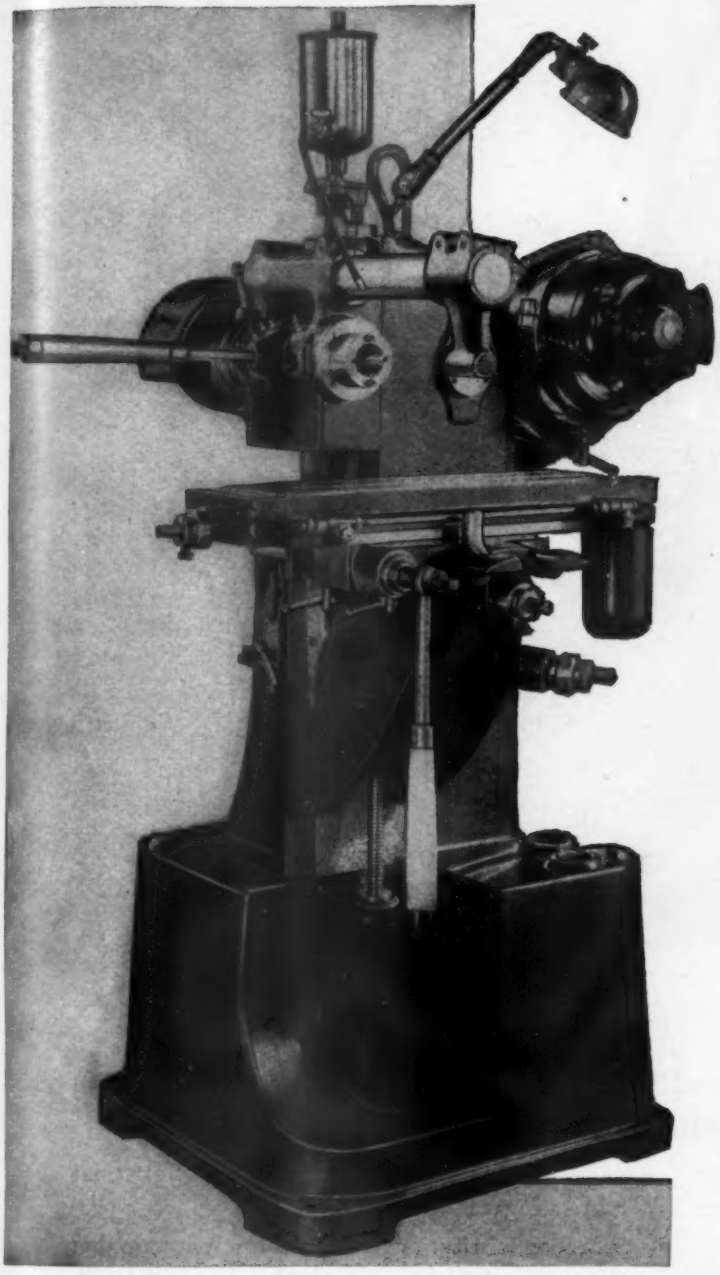
ONLY PHILLIPS SCREWS HAVE THE ENGINEERED TAPERED RECESS

1. **Fast Starting**—Driver point automatically centers in the recess . . . fits snugly. Screw and driver "become one unit." Fumbling, wobbly starts are eliminated.

2. **Faster Driving**—Spiral and power driving are made practical. Driver won't slip out of recess to injure workers or spoil material. (Average time saving is 50%.)

3. **Better Fastenings**—Screws are set up uniformly tight, without burring or breaking heads. A stronger, neater job results and there are no gouges on work-surface.

Put the Screws on the Axis ★ BUY WAR BONDS



Nichols Millers

WITH RISE and FALL SPINDLE

Where can you find the equal of the Nichols Miller in versatility of production and precision operation? Besides conventional milling, the Nichols Miller performs dozens of unusual operations *to tolerances in tenths.* Rise-and-fall spindle arrangement and a full line of attachments make the Nichols especially adaptable for production, toolroom or laboratory. WORKING SURFACE: 6¾" x 21", or 6¾" x 30". RANGE: Longitudinal 10" or 19"; Transverse 7"; Vertical-Knee 13½"; Spindle Rise and Fall 4½". STANDARD SPEEDS: to 2400 RPM. SPECIAL SPEEDS: to 5000 RPM.

MANUFACTURED BY

W. H. NICHOLS AND SONS

WALTHAM, MASS.

TODAY'S MULTI-PURPOSE PRODUCERS

- √ Keyseat Milling
- √ Profiling
- √ Boring
- √ Facing
- √ Diamond Wheel-Grinding
- √ Turning
- √ Recessing
- √ Under-cutting

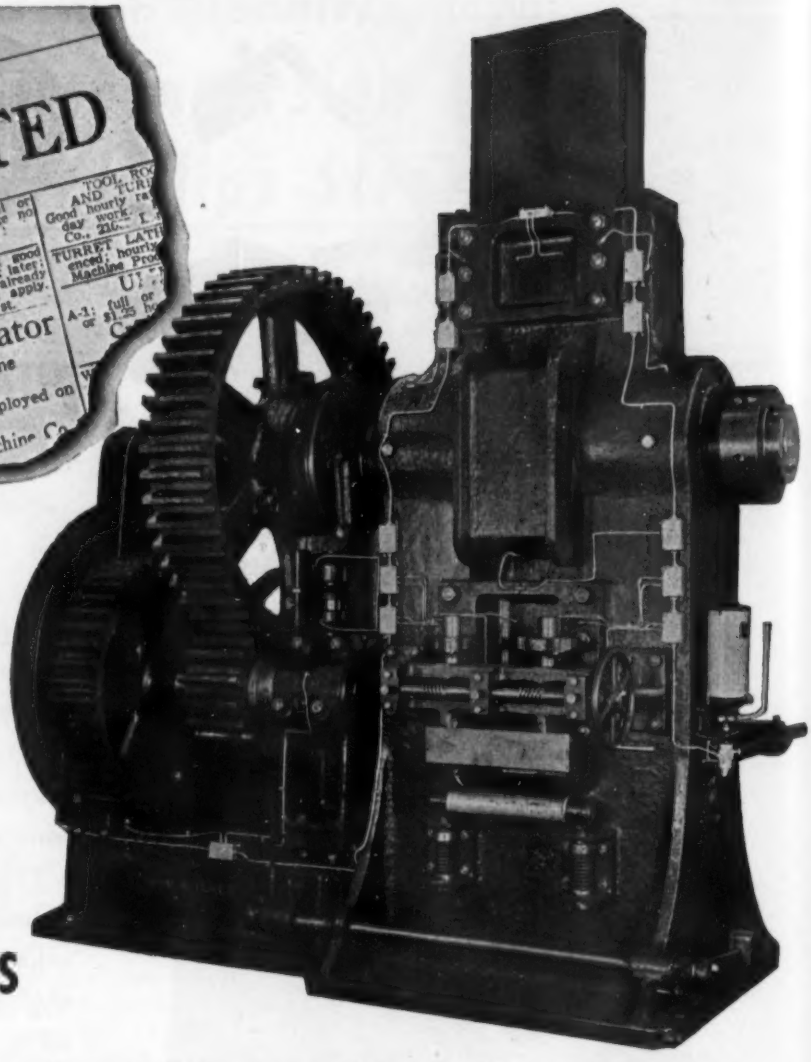
For illustrated descriptions of how these and many other operations are performed on the Nichols Miller, send today for free 86-page Handbook of unusual applications.

IMMEDIATE DELIVERIES!

SOLE DISTRIBUTORS

NICHOLS-MORRIS CORPORATION

50 CHURCH STREET, NEW YORK 7, N. Y.



HELP RELIEVE YOUR MANPOWER SHORTAGES WITH

TRABON

LUBRICATING SYSTEMS

They Relieve "Oilers" and "Greasers" for other work . . . provide better, more dependable, less costly lubrication

● Avoid the costly down-time while an oiler crawls over a machine lubricating each bearing individually,—the breakdown if he misses one,—the costs and lost time of accidents. You can assign these men to other, more important, and safer work by equipping your machines with Trabon Lubricating Systems!

On overhead traveling cranes, costly steel mill equipment, forging presses, brakes, shears, crushers, and boring mills, screw machines, punch presses, and other lighter duty machinery, Trabon lubrication—for years—has been proving its dependability in meeting every industrial lubricating requirement.

Trabon lubrication makes absolutely certain that every connected bearing whether large or small, easy or difficult to reach, receives the exactly desired amount of lubricant. It minimizes down-time and machine tie-ups—prolongs bearing life—reduces accidents and compensation costs. Install Trabon on your machines and get the many design and operating advantages only Trabon can give you. Manual or automatic operation. Send today for new fully descriptive Engineering Bulletins!

TRABON

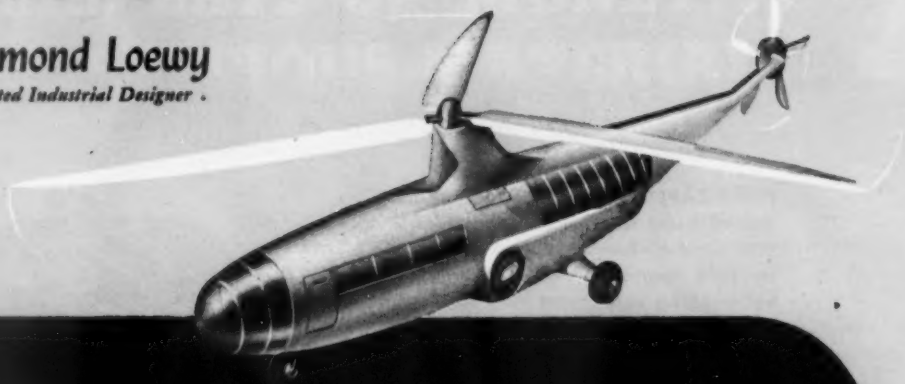
ENGINEERING CORPORATION

1819 *East 40th Street* ◆ *Cleveland, Ohio*

INDUSTRIAL LUBRICATION EXCLUSIVELY SINCE 1922

I PREDICT...

by Raymond Loewy
Noted Industrial Designer



After the war you will travel more than you ever have. And one of the developments that will make it possible is the new helicopter air bus. This remarkable aeronautical achievement ushers in a really new mode of transportation that will enable you to make short air trips quickly, inexpensively and in complete comfort. Present bus terminals will be adapted as landing ports and maintenance hangars so you will take off and arrive in central sections of cities and towns. The multi-passenger helicopter air bus, already endorsed by authorities as entirely practical, will bring air travel to millions of persons and thousands of communities that now lack this form of transportation. When you buy War Bonds today remember they will enable you to experience this and many other marvels in tomorrow's world!

* * *

Note: The Weatherhead Company, one of the oldest and most important manufacturers of parts for the aviation industry, is prepared for the day when its four plants will again be contributing to aviation's peacetime needs.

Look Ahead with ⟨W⟩

Weatherhead

THE WEATHERHEAD COMPANY, CLEVELAND, OHIO
Manufacturers of vital parts for the automotive, aviation, refrigeration and other key industries.

Plants: Cleveland, Columbia City, Ind., Los Angeles
Canada—St. Thomas, Ontario

***FREE:** Write on company letterhead for "Seeds Of Industry"—a history of The Weatherhead Company, its many facilities and diversified products.*

"Manufactured Scrap"

THIS HEAPED UP HANDFUL contains 3 lbs. of head trimmings obtained from 100 ¾" x 6" hexagon head bolts made by cold forging on the most modern bolt-making equipment in a Lamson & Sessions plant. ONE BOLT PER SECOND can be produced by this method.

WASTE OF RAW MATERIALS RATIO is 25:1 in this instance MADE BY EITHER METHOD the finished bolt weighs 13½ oz.

THIS WHEELBARROW contains
of turnings made in producing 10
6" hexagon head bolts on the mo
ern six spindle automatic screw
in a Lamson & Sessions plant. O
PER MINUTE can be made by this

. . . PRODUCED IN MAKING A BOLT EATS UP TIME, EATS UP MONEY . . . AND EATS UP PRECIOUS MATERIAL!

Whether the material for making bolts is aluminum, copper alloy, alloy steel or just plain carbon steel—there is sure to be a needless waste of raw material required for any given quantity of bolts made by milling as compared with making those same bolts by cold forging.

Lamson & Sessions makes bolts by both methods—and always has—but the trend toward cold forging bolts is now so strong that virtually 98% or more of our entire production is by hot or cold forging, otherwise known as upsetting.

Of the two methods of bolt manufacture—milling and upsetting—milling is the slowest and most exacting method. It is very accurate, but very slow; very expensive because close personal supervision of the machine is essential and it is very wasteful of raw materials.

By weighted averages, the waste factor in manufacture by milling as opposed to production by upsetting (cold forging) is about 20:1. The waste (chips produced by milling) ordinarily cuts away about 50% or more of the raw material. We scrap less than 5% of the raw material when we make bolts by upsetting.

Cold forging and rolling threads produces bolts to such close tolerances that the aircraft industry has accepted them after exacting tests had demonstrated them equivalent or superior to the milled product.

It may be made axiomatic—any bolt that *can be made* by hot or cold forging, *should be made* by hot or cold forging, if the quantity required is large enough to justify making the necessary forging dies.

At left is an actual example of scrap produced per 100 bolts (¾"x6", hexagon head) as made by both milling and cold forging.

Keep this in mind when you design for assemblies for war production—*and for post-war manufacturing too.*

THE LAMSON & SESSIONS COMPANY, General Offices, Cleveland, O.

"BOLTS ARE IMPORTANT!"—24-page booklet of currently useful information for buyers of headed and threaded products, and describing Lamson & Sessions' specialty fastenings which have wide industrial applications—*now, and in the post-war period.*

"THE LAMSON BLUE BOOK"—is our standard Catalog of standard products excepting our Aircraft products.

"BOLTS, NUTS & SCREWS"—70 pages of technical and practical information. First copy gratis, requested on your letterhead. Additional copies one dollar each.

"SIMPLIFIED STOCK LIST"—Of bolts, nuts and screws, conforming to latest revisions of the Office of Price Administration, and of great value in showing you in what ratio quantities of various standard products are kept in stock for deliveries, by your jobbers and in our own (and other bolt manufacturers') warehouse stocks.

HERE'S A COUPON FOR YOUR CONVENIENCE

THE LAMSON & SESSIONS COMPANY • 1971 West 85th Street • Cleveland 2, Ohio

Please send us ☐ Lamson Blue Book ☐ Bolts, Nuts & Screws
☐ Bolts are Important! ☐ Simplified Stock Sizes

Name of Individual _____ Title or Kind of Work _____

Employed by (Name of Company) _____

Street Address _____

City and State _____

No. 1908—Copyright 1944—The Lamson & Sessions Co.

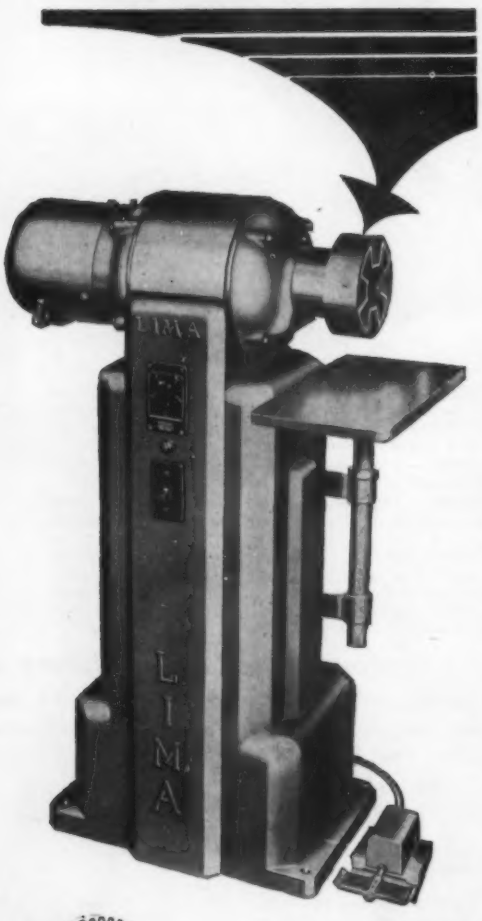
LAMSON & SESSIONS

BOLTS · · NUTS · · COTTERS · · CAP SCREWS · · SPECIALS

Your Jobber Stocks the Lamson Line

CAN YOU POLISH THESE PIECES —

WITHOUT LEAVING CHUCK or COLLET MARKS?



YOU CAN... WITH A LIMA MAGNETIC POLISHING LATHE

Magnetic chuck holds ferrous metal parts from 7/8" up. This chuck, with the use of interchangeable face plates and register plugs, makes the Lima Magnetic Polishing Lathe a most flexible unit to rapidly handle various size parts in polishing, burring or lapping operations. Entirely magnetic, the chuck has ample power to hold material rigid and secure, making possible mirror finishes, without leaving chuck or collet marks to be polished out after main operations are completed. A self-contained rectifier unit supplies DC current to chuck.

In addition, the *"Step-Release"* foot pedal control of the motor and chuck, is another important LIMA feature which increases handling speed. This control allows the operator freedom of both hands to be used in placing, processing and removing work from the chuck.

The Lima Magnetic Polishing Lathe is furnished in Pedestal or Bench type, powered by a dependable LIMA drip-proof motor. These motors are furnished in single or two speed, 2 or 3 phase, with speeds to 3600 rpm as required. Standard equipment includes a magnetic disc-type brake for rapid stopping of motor and chuck. Wire or write today for complete Engineering data.

Manufactured by

The LIMA ELECTRIC MOTOR Company

1504 FINDLAY ROAD

LIMA, OHIO, U. S. A.

MAGNETIC POLISHING LATHES . . . GEARSHIFT DRIVES . . . PEDESTAL GRINDERS . . . ELECTRIC MOTORS

FOR THE WAR PROGRAM

27 BULLETINS on Ball Bearings — their use, installation and maintenance.

Available to Engineers, Designers, Draftsmen, Shop Men, Service Men and Maintenance Men.

Sent on your request; write, giving your title or position and name of company.

TYPES OF BALL BEARING MOUNTINGS
MRC
M-R-C
Load Computation Manual
PREPARING SHAFTS for BALL BEARINGS
HOUSING BORE LIMITS FOR BALL BEARINGS
TYPICAL MOUNTINGS OF SNAP-RING BALL BEARINGS
OIL LUBRICATION OF BALL BEARINGS—HIGH SPEEDS
SHAFT SHOULDERS AND SHAFT FILLETS
OIL LUBRICATION OF BALL BEARINGS
DUPLEX BEARING MOUNTINGS
GREASE LUBRICATION OF BALL BEARINGS

M-R-C LOAD COMPUTATION MANUAL is a 68-page booklet of methods for calculating loads on bearings. Sent free to mechanical engineers and draftsmen. Send request on your company stationery.

M-R-C BALL BEARINGS

MARLIN-ROCKWELL CORPORATION

Executive Offices: JAMESTOWN, N. Y.

DE-BURR MECHANICALLY!

ROTO
THE STURGIS PRODUCTS CO.
STURGIS • MICHIGAN
Trademark Reg. U. S. Pat. Office
FINISH

This large casting, with its many important surfaces, critical dimensions and dozens of holes, part of them threaded, is deburred mechanically by the Roto-Finish Process. The result is a highly profitable saving in time over hand methods and an improved microinch finish!

This startling new process for deburring, grinding, honing, buffing and coloring is used with equal success on a wide range of steel, brass, aluminum, stainless and nickel steel parts . . . from small pieces up to 75 pound castings. Send for complete information . . . or let us process samples of *your* parts—without charge!

THE STURGIS PRODUCTS CO.

204 JACOB STREET, STURGIS, MICHIGAN

FURNISH them with *Sellers Drill Grinding Machines,* and "war babies" quickly learn to turn out a full supply of drills ground to scientifically correct points.

Regardless of skill or experience *they can't go wrong,* because the chuck automatically sets the proper grinding angle every time.

The result is faster, more accurate drilling . . . Increased production . . . More holes per grind . . . Longer drill life . . . Lowered set-up and assembly costs . . . Greatly reduced drill inventory:

In other words—an investment that starts paying dividends from the start.

For first-hand evidence of the superiority of a Sellers' point send us three drills up to 3" dia. and we will return them correctly ground without charge or obligation. Wm. Sellers & Company, Hamilton Street, Philadelphia, U.S.A.

CABINET TYPE 1G

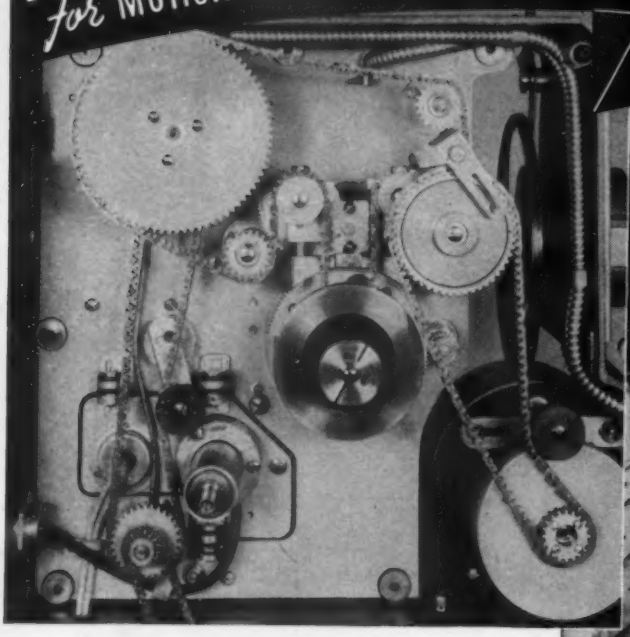
TYPE 6G

SELLERS DRILL GRINDING MACHINES

SELLERS PRECISIONEERING SINCE 1848

© 1943, Wm. Sellers & Co.

For MOTION PICTURE PROJECTORS and 30 ton MACK TRUCKS



MORSE
makes them both
MINUTE and MIGHTY

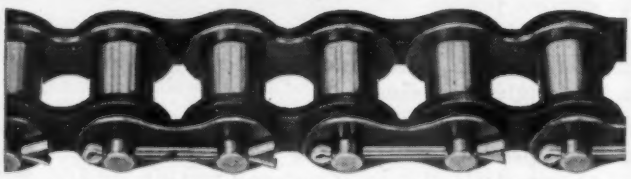
Movies would flicker, the strong, silent movie hero would threaten the villain with his hands flickering nervously, instead of with calm assurance—all performers would jerkily hop about—if film was passed through projectors at an uneven rate of speed, if slipping drives were used to turn the spools of film projectors.

With minute Morse 3/16" pitch chain on the job, however, film spools are turned smoothly and silently, at a constant rate of speed—because Morse Chains *cannot slip*. Flexible, and as positive as gears, minute Morse Chain is ideal for timing motions, for transmitting fractional HP loads.

And, By Contrast . . .

Morse Chains of greater pitch are used on 30-ton Mack Trucks employed in the mining industry, in steel mills, on Diesel engine transmissions—again because they are positive in action, *cannot slip*, cannot waste power.

More efficient transmitters of power, Morse Chains are available in sizes from 3/16" to 3" pitch—for power loads of fractional to 5,000 HP. Exceptionally long-lived, they save money as well as power, by eliminating the need for frequent adjustment and replacement, by upping machine output. Specialists, with close to half a century's experience in the field of power transmission, Morse makes better chain drives, built on the principle of . . .



TEETH, NOT TENSION

SPROCKETS ..... CHAINS ..... FLEXIBLE COUPLINGS ..... CLUTCHES

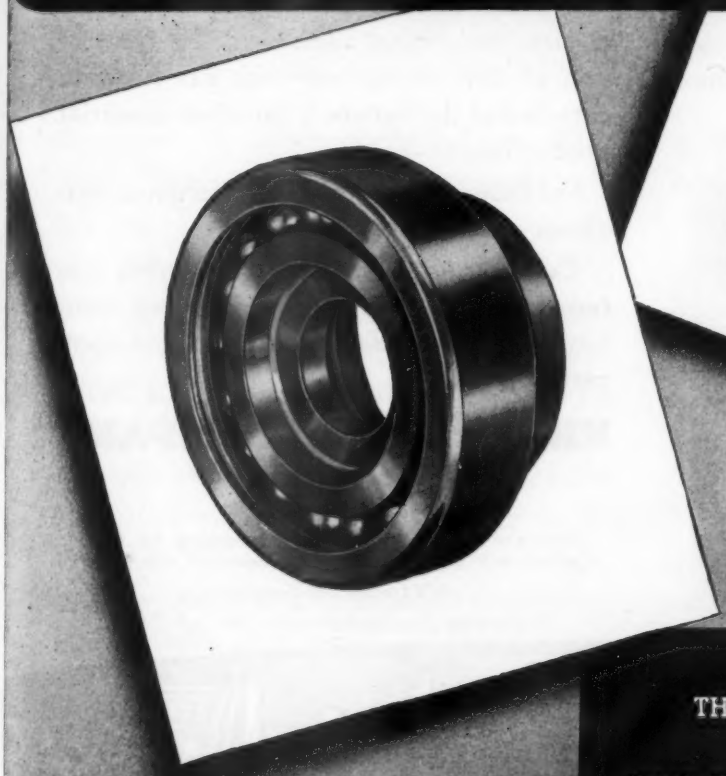
MORSE Roller and Silent CHAINS

MORSE CHAIN COMPANY • ITHACA, N. Y. • DETROIT, MICH. • A BORG-WARNER INDUSTRY

QUALITY ACCURACY PRECISION

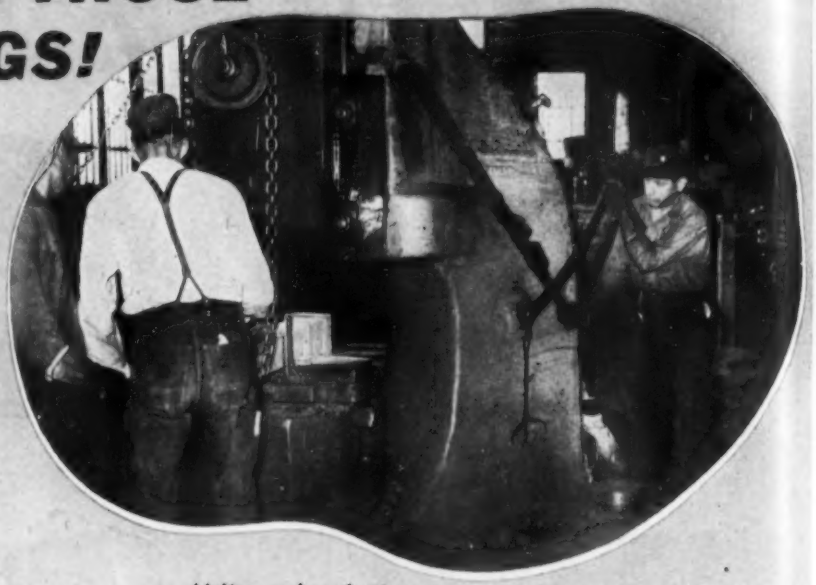
FOR THE DURATION, WE ARE UNABLE TO SUPPLY MANY TYPES OF BEARINGS FORMERLY MANUFACTURED

"Commercial" ANNULAR BALL BEARINGS



THE SCHATZ MANUFACTURING CO.
U. S. A.
REPRESENTATIVES LOCATED AT
Detroit: 2640 Book Tower • Chicago: 902 S. Wabash Ave.
Cleveland: 402 Swetland Bldg. • Los Angeles: 5410 Wilshire Blvd.

PERHAPS YOU *NEED NOT WAIT FOR THOSE DROP FORGINGS!*



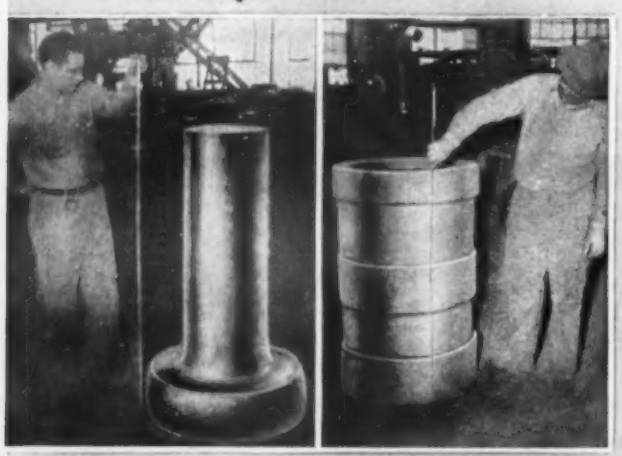
Making a drop forging on a flat die hammer with special forging tools.

RELIEF for many who are waiting for urgently needed drop forgings is now available from the flat die department of Kropp Forge.

Many drop forgings—so difficult to procure at this time—can be produced within reasonable tolerances as hammer forgings, through the use of standard forging tools, supplemented by special tools developed at Kropp Forge. Large, chunky pieces such as gear blanks, large connecting rods, spindles, large crank shafts, etc., can be so made; the recesses, if any, being removed on the lathe, which is probably the least expensive type of machine work today.

Relief is also available for those who are machining parts out of billet stock at excessive cost. The flat die process can be used most advantageously; at least to give such parts the general contour desired, and to impart to the metal the strength and stress resistance obtainable only under the hammer.

Left, stub connecting shaft made on a flat die hammer with the aid of the ring tools shown at right.



We are already performing the above services for critical customers. The completion of part of our war task has released certain flat die hammers for other essential production.

For those who require upset forgings, machines are now available.

Call your nearest Kropp engineering representative, or write us regarding your requirements, sending blue prints and complete details.

KROPP FORGE COMPANY

5301 W. Roosevelt Road
Chicago (50), Ill.

Makers of Drop, Upset and Hammer Forgings for Armament and Ordnance and Machinery of All Types

"World's Largest Job Forging Shop"

Engineering Representatives in Principal Cities

SERVING INDUSTRY SINCE 18 31 OVER 100 YEARS
KROPP FORGE CO

KROPP

ARMY ★★ E ★★ NAVY

"YOU MAY NOT KNOW IT, BUT

IF YOU MAKE THESE...

YOU'RE IN THE BUSINESS OF MANUFACTURING CHIPS"

We think the little fellow has something there. Even though brass turnings *do* have a relatively high salvage value, you wouldn't manufacture them purposely. Your interest, of course, is in those parts which, by way of illustration, might be called the by-product—the parts that remain after the surplus metal has been removed. Yet a substantial portion of the cost of screw machine products is determined by the size and shape of those chips; by the speed with which they are removed; by the finish they leave, and the running time before tools require regrinding or adjustment. Summed up, it's the *machinability* of the rod that counts.

Many screw machine products manufacturers are keenly aware of the competition in this field. They know from experience that a few seconds' time per piece may spell the difference between a profit and loss. They also know, as we do, that Anaconda Copper, Brass, Bronze and Nickel Silver Rods are as consistently uniform in composition, temper, and machining characteristics as strict laboratory control and modern brass mill practice can make them.

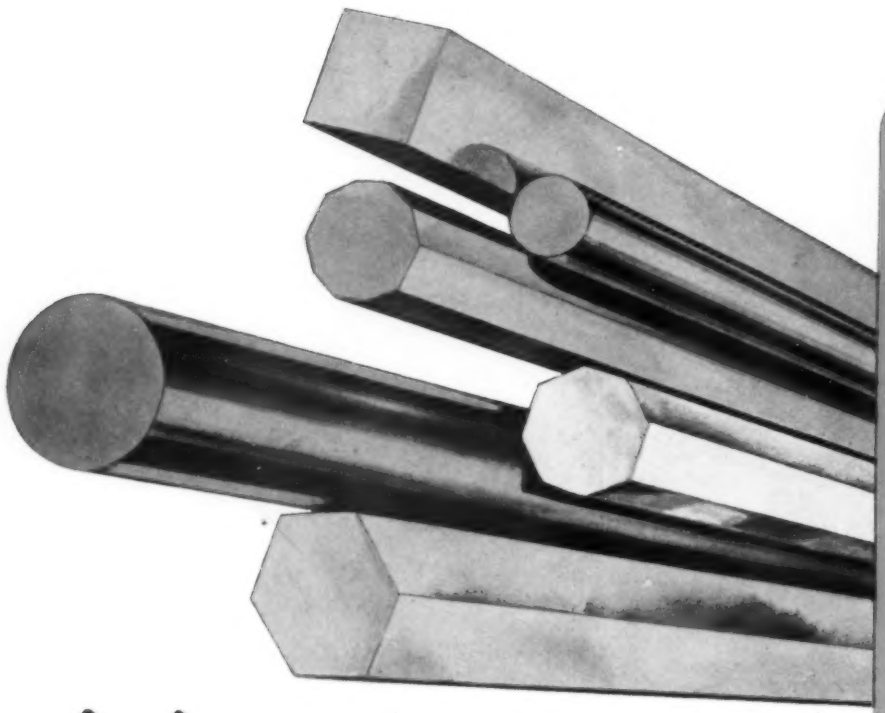
THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut

Anaconda Rods are listed on the following page.

ANACONDA
from mine to consumer

Anaconda Free Cutting Rods



44 COPPER AND COPPER ALLOY RODS FROM WHICH TO CHOOSE

All users of rod stock will agree that there is usually ONE best rod for a specific application. Finding that rod is sometimes a problem. If you feel that the practical metal-working experience of our Technical Department may be of assistance, let us know. We'll be glad to cooperate.

Listed here are 44 of a large number of Anaconda Copper and Copper Alloys manufactured in rod form. They are made in all commercial sizes and shapes. Special Shapes in rod form are also produced by The American Brass Company in copper, brass, bronze and some nickel silver and phosphor bronze alloys.

Publication B-14 discusses Anaconda Copper Alloy Rods. Publication B-3 offers practical suggestions for machining. Either one or both of these booklets will be mailed on request.

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut
Subsidiary of Anaconda Copper Mining Company
In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

16 Leaded, Free Cutting Rod Alloys

COPPER
- Leaded Copper—946

LEADED BRASSES
- Leaded Commercial Bronze—202
- Hardware Bronze—267
- Leaded Red Brass 80%—205
- Leaded Brass—211
- Butt Brass—229
- Free Cutting Yellow Brass—271
- Forging Brass—250
- Extruded Architectural Bronze—280

SPECIAL BRASS
- Leaded Naval Brass—612

PHOSPHOR BRONZES
- Special Free Cutting Phosphor Bronze—610
- Leaded Phosphor Bronze 5%—979 (Grade B)

NICKEL SILVERS
- Extruded Leaded Nickel Silver 10%—823
- Leaded Nickel Silver 12%—796
- Leaded Nickel Silver 18%—789

COPPER-SILICON ALLOY
- *Everdur—1012 (Leaded)

28 Other Machinable Rod Alloys for General and Engineering Uses

COPPERS
- Electrolytic Tough Pitch Copper
- Deoxidized Copper—939

BRASSES
- Commercial Bronze 90%—14
- Red Brass 85%—24
- Red Brass 80%—32
- Yellow Brass—61
- Muntz Metal—66

SPECIAL BRASSES
- Naval Brass—452
- *Tobin Bronze
- Manganese Bronze—937

PHOSPHOR BRONZES
- Phosphor Bronze 4%—903 (Grade A)
- Phosphor Bronze 5%—351 (Grade A)
- Phosphor Bronze 8%—353 (Grade C)
- Phosphor Bronze 10%—354 (Grade D)
- Phosphor Bronze—314
- Phosphor Bronze—316

NICKEL SILVERS
- Nickel Silver 18%—719
- Nickel Silver 18%—723
- *Ambrac—850

CUPRO NICKEL
- Super Nickel—701

ALUMINUM BRONZES
- Ambraloy—901
- Ambraloy—928
- Ambraloy—917
- *Avialite—915

COPPER-SILICON ALLOYS
- *Everdur—1010
- Everdur—1015

BERYLLIUM COPPER—175 (Unheat-treated)

CHROMIUM COPPER—999

*Trade-Mark Reg. U. S. Pat. Off.

ANACONDA from mine to consumer

Anaconda Copper & Copper Alloys

Are you giving proper consideration to your tool bit requirements . . .

TOOL bits produced by different makers may *look* somewhat alike—but that's where similarity ends! The difference is in *quality*—in *performance*—and in the field of high speed steel Ground Tool Bits and Turning Tools, the name GORHAM has long been recognized by industry as "Tops".

This reputation came through consistently producing tools of superior quality—through long experience in the selection and heat treatment of materials to produce the proper tool for the particular job.

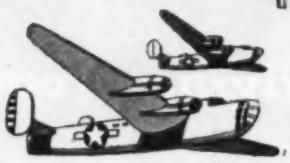
For example, when increasing use of Molybdenum high speed steels called for Super Molybdenum tools and bits with performance characteristics comparable with Super tungsten high speed steel, it was GORHAM'S "know-how" and experience which made possible the M-40 series—now widely used all over the country.

In manufacturing Ground Tool Bits and Turning Tools, GORHAM uses oversize hot rolled bars and cuts them to standard length. By soft grinding the annealed stock, the scale and decarbonized surface is removed, preparing the steel for hardening. After a closely controlled heat treatment, the blanks are again ground square and to size to remove any decarbonized surface. You get an *accurately-ground, uniformly hardened,* ready-to-sharpen tool!

CATALOG UPON REQUEST

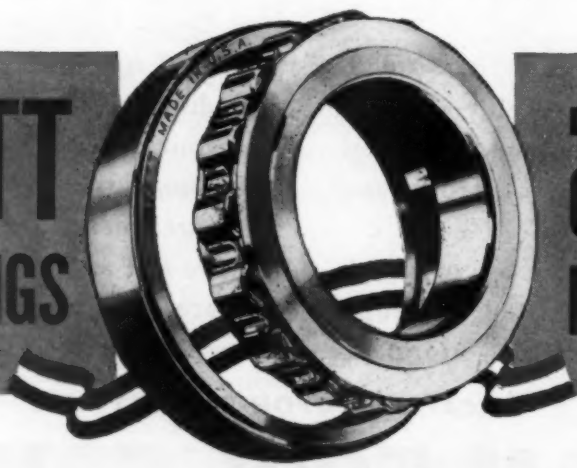
GORHAM TOOL COMPANY

14400 WOODROW WILSON • DETROIT 3, MICHIGAN

All of Hyatt's Production now goes into planes  our men fly ...into tanks they drive... into ships they sail...into guns they man...into equipment they need to win.

HYATT ROLLER BEARINGS SERVE SILENTLY, ACCURATELY, EFFORTLESSLY WHEREVER GEARS, SHAFTS, AND WHEELS TURN

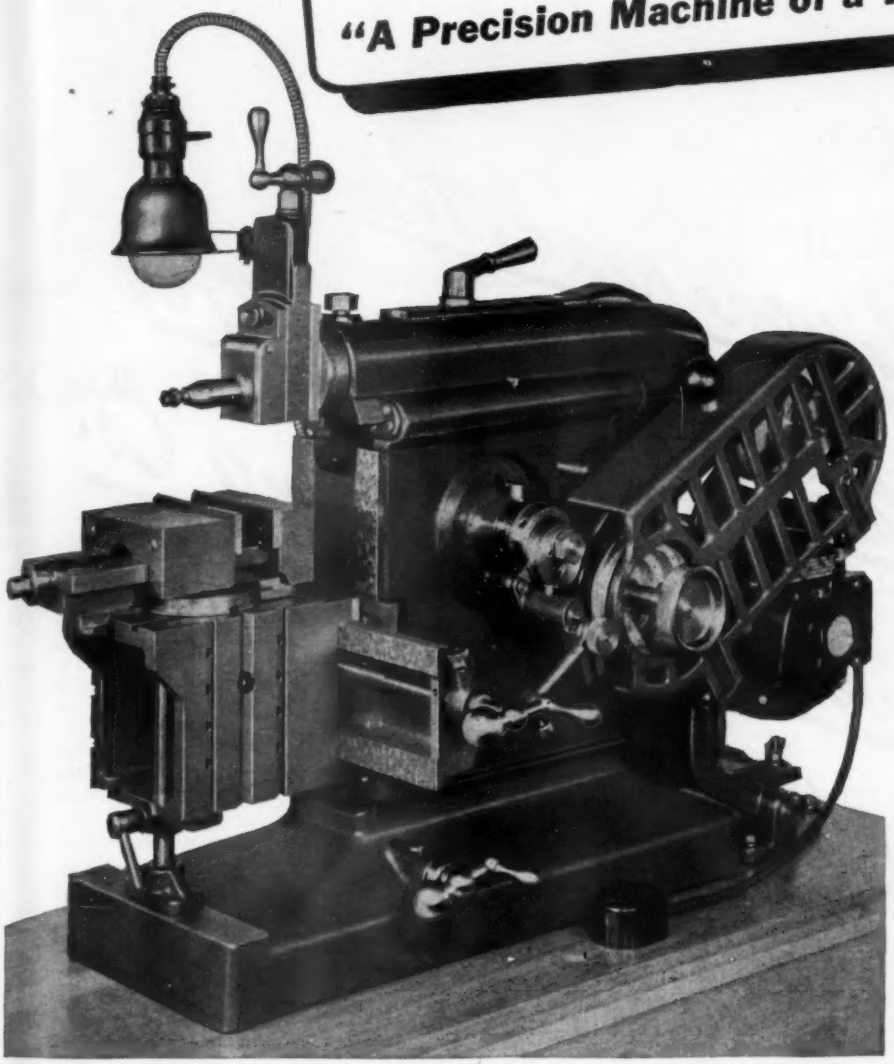
HYATT BEARINGS



DIVISION OF GENERAL MOTORS

HYATT BEARINGS DIVISION • GENERAL MOTORS CORPORATION • HARRISON, NEW JERSEY

AMMCO
7" SHAPER
"A Precision Machine of a Thousand Uses"



A wide variety of jobs can be done accurately, quickly, easily and economically on the AMMCO 7" Shaper.

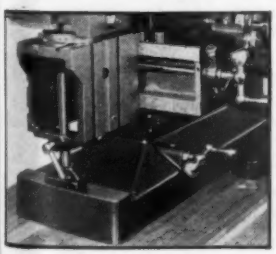
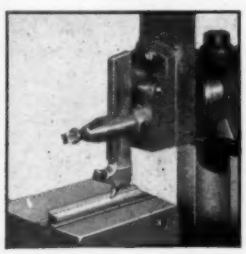
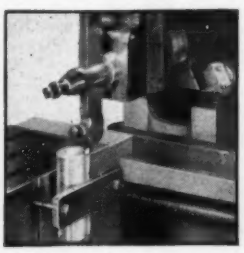
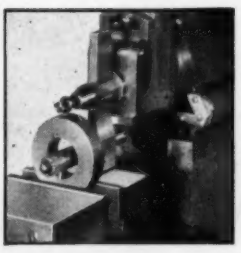
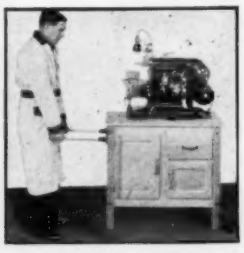
This precision machine has proved itself an essential machine tool for handling exacting jobs in industrial plants, the army, the navy, the marine corps, in mobile machine shops, government agencies, laboratories, tool makers shops, technical schools, etc.

Construction incorporates many features you would expect to find only in larger, more expensive machines... For example: WAYS of ram, tool head, and front face of the main frame are of the "VEE" type, hand scraped to insure accuracy and long life.

Available for stationary installation or as portable unit ...Portable model is mounted on sturdy maple cabinet, and can be rolled from job to job ...Just plug in to an electrical outlet, and go to work. Saves steps and time.

★

Has "VEE" Type Ways . . . Handles a wide variety of work . . . Accurate . . . Portable

Write today for specifications and prices

ARMY E NAVY

AMMCO 2100 COMMONWEALTH AVENUE
NORTH CHICAGO, ILLINOIS

Did you read the Important Announcement by The Bakewell Manufacturing Co. and Warner & Swasey?

SEE PAGE 80

)n a GORTON 16-A

Precision

PRECISION plus HIGH PRODUCTION on Small Parts

ON EVEN COMPLEX PARTS like this at right . . . HIGH PRODUCTION . . . FINE FINISH . . . HIGH PRECISION . . . Tolerances within ±.0005" on all dimensions are obtained on the Gorton 16-A Precision Automatic Screw Machine using single-point, low cost tools.

Each part is *completed* within the close limits specified in only one operation.

This precision performance on long production runs is made possible by the rigid construction of the Gorton 16-A, one of the heaviest Swiss-type screw machines built.

Wide Range of Work

The Gorton 16-A produces an almost endless variety of short or long, slender parts — diameters .005" to 7/16", lengths 1/32" to 2¾"—complete in one operation.

It does step turning, generates curves, tapers, back recesses, knurls, chamfers, etc. It centers, drills, slots, threads or taps.

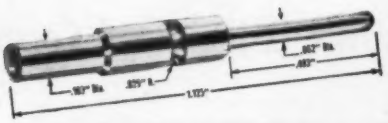
Tool slides are easily accessible. Micrometer adjustments for all tools insure accurate, quick setups at low cost. Centralized finger-tip controls provide infinitely variable spindle speeds (1100 to 10,000 R.P.M.) and infinitely variable cam feeds (20 to 720 pieces per hour; 20 to 1440 optional). No speed or feed gears to change.

GORTON Complete Cam and Tool Service

For Any Make Swiss-Type Screw Machine — Gorton or Others

Gorton exclusively offers a complete cam and tool service. Highly skilled engineers are available to take care of all your needs. This service consists of a detailed cam and tool layout, listing all operations of the machining cycle together with necessary cams, tools, collets and bushings. This service is available at the Gorton factory at Racine, Wis., for the Midwest and Pacific areas; and from Russell, Holbrook, and Henderson (our Eastern Distributors) of New York City for quick service in the East.

TOLERANCES ±.0005" ON ALL DIMENSIONS



THIS PART COMPLETED *in One Operation*

IN LESS THAN 9 SECONDS

Tooling: Five flat cams, one bell cam, five cutting tools, one drill, two collets, one bushing.

OPERATIONS

1—Center for #49 drill.
2—Turn .103" dia. and form 54° angle. Drill #49 dia. hole .281" deep.
3—Form .075" dia. groove.
4—Form 25° angle and turn .062" dia.
5—Form .031" radius and cut off finished part.

Material: .125" Round Free Cutting Brass.

Production: 7 pieces per minute.

These other typical parts shown actual size

GEORGE GORTON MACHINE CO.
1315 Racine St., Racine, Wis.

Send me, without obligation, FREE bulletin with complete information covering the Gorton 16-A Precision Automatic Screw Machine.

Name..... *Title*.....
Company.....
Address.....
City..... *State*.....

E NAVY

Added D AWARD

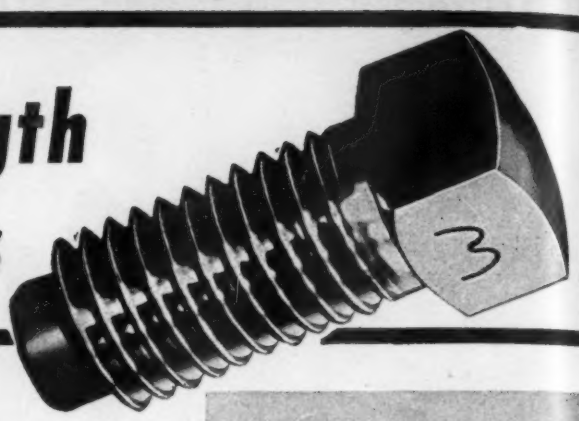
GET THE FACTS NOW

Mail Today for FREE Bulletin

GEORGE GORTON MACHINE CO.
1315 RACINE STREET, RACINE, WISCONSIN, U. S. A.
SPECIALISTS FOR 50 YEARS IN TRACER CONTROLLED MACHINES—ENGRAVING, DIE MAKING, VERTICAL MILLING MACHINES

IST

Added Strength Saves Replacements



These Screws Have a Place in Your Plant

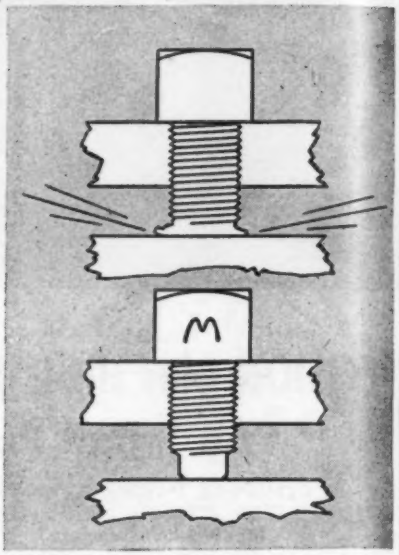
Where tremendous gripping power is necessary and projecting heads present no hazard, there is no substitute for just plain strength. Broken screws, upset points and fatigue failure can be avoided by specifying stronger screws.

Mac-its

PRONOUNCED "MACK-IT"

OTHER MAC-IT PRODUCTS INCLUDE:
Hexagon Socket Cap Screws • Hexagon Head Cap Screws • Hollow Set Screws Hollow Pipe Plugs • Stripper Bolts

Mac-it Square Head Set Screws are heat-treated for maximum torsional strength and to resist upsetting of the points. A ⅝" Mac-it, for example, has a gripping power of more than 25 tons!



4321

Strong, Carlisle & Hammond Company Cleveland, Ohio

FOR FUTURE PLANNING

SPECIFY...

GUSHER COOLANT PUMPS

Gusher Coolant Pumps are used by leading machine tool manufacturers. They are simple in design. They have few moving parts. They require minimum maintenance. Not injured by chips or grit. Capacity is from trickle to 200 g.p.m. Many exclusive advantages. There's a type and size to meet your requirements. Write for new complete catalogue.

MODEL 1-P3 "V" BELT

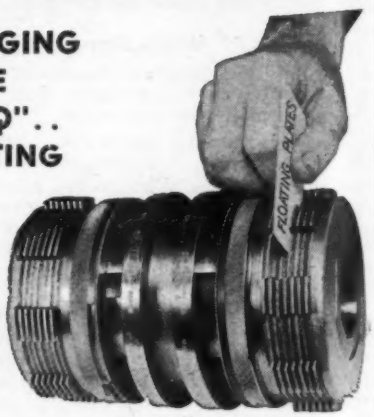
The essential features are the same as motor-driven Gusher models, the only difference being the substitution of an automatically oiled gear-driven mechanism for the motor.

THE RUTHMAN MACHINERY CO.
1809 READING ROAD CINCINNATI 2, OHIO
LARGEST EXCLUSIVE BUILDERS OF COOLANT PUMPS

THE JOHNSON FRICTION CLUTCH

QUICK DISENGAGING ASSURED BY THE NEW "MAXITORQ".. MULTIPLE FLOATING DISC CLUTCH

Single Type



Double Type

This recent Carlyle Johnson development features floating discs, manual assembly, simple adjustment and smooth, easily controlled engagement.
In the wet type, all discs are of hardened steel and run in lubricant; dry type with alternate discs of steel and self-lubricating bronze. Separator springs between active discs asure quick disengaging and prevent excessive drag.
"MAXITORQ" Clutches represent a distinct advance in this type of mechanism and are applicable for all types of power transmission where smooth operation and quick action are required. Made in capacities from ½ HP to 5 HP at 100 R.P.M. in single, double and cut-off coupling types.

Investigate Today! Send for detailed specifications and dimension sheets

WRITE FOR MULTI DISC CLUTCH CATALOG NO. 31 OR CONSULT SWEET'S OR THOMAS' REG.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER, CONN.

TO ASSURE

PRECISION PERFORMANCE!

Extreme care and constant checking at each stage in their production give Link-Belt Friction Fighter Roller Bearings the precision required for the outstanding service they are engineered to deliver.

Final production line inspection, shown above, in view taken in Link-Belt Company's Dodge plant, allows only perfect parts to be assembled and receive the Link-Belt Quality Stamp—your assurance of efficiency and long life. Friction Fighter bearings are obtainable in a wide range of sizes, roller and ball types, unmounted or mounted in pillow blocks, cartridge and flanged units, or other mountings to suit all conditions of service.

Complete description and full engineering data are contained in Book 1775-A. Write for a copy today. Link-Belt Company. Indianapolis 6, Chicago 9, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Toronto 8. Offices, factory branch stores and distributors in principal cities.

9448

LINK-BELT

FRICTION FIGHTER BEARINGS

Roller and Ball Types

OPERATE SMALL MACHINES ?

THESE COOLANT PUMPS WERE DESIGNED PARTICULARLY FOR *You!*

MVA — A submerged type to be mounted in sump or separate tank.

MVBD — for mounting on outside of coolant tank or machine pedestal.

Though only about 16 inches high these pumps will bring you the same high efficiency in coolant flow as that delivered by the full sized counterparts. Powered with heavy duty, long hour, totally enclosed, ball-bearing motors.

Model MVBD requires no intake piping; intake is through a hole in mounting pad. Three outlets in pump body permit optional piping to right, left, or back into coolant sump through intake bracket.

Model MVA designed for machines with coolant sump provided in base or for mounting in a separate coolant tank. Chips that will pass through grille (at bottom of pump) will readily pass through the pump without causing damage. Pioneer Pump & Mfg. Co., 19651 John R. St., Detroit 3, Michigan.

PIONEER *Pumps*

HIGH EFFICIENCY • LOW POWER CONSUMPTION
GREATER VOLUME AND LESS MAINTENANCE

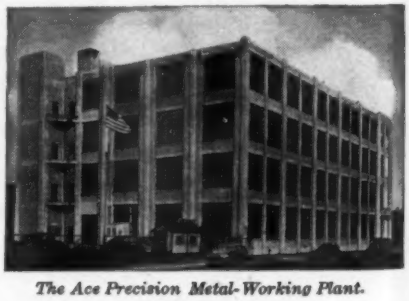
PRECISION PARTS

25 YEARS... *a long grind*

THE smoke of battle from the last war had hardly cleared away when the present owners of Ace went into business as makers of precision parts. Those first few years after World War I were not easy. But doing highly accurate work, and doing it better and faster, carried Ace steadily along until today it is one of America's outstanding precision metal-working plants.

To our customers and suppliers with whom we have had the privilege of working during this quarter-century, we extend our hearty thanks. To future customers, we pledge the same careful attention to specifications that has made so many friends for Ace in the past.

Let us quote you on small parts or assemblies calling for stamping, machining, heat-treating, or grinding. Send sketch or blueprint.



The Ace Precision Metal-Working Plant.

ACE

ACE MANUFACTURING CORPORATION
for Precision Parts

1207 E. ERIE AVE., PHILADELPHIA 24, PA.

JUST A MITE OF A PUMP, BUT DYNAMITE IN ACTION

TUTHILL MODEL L

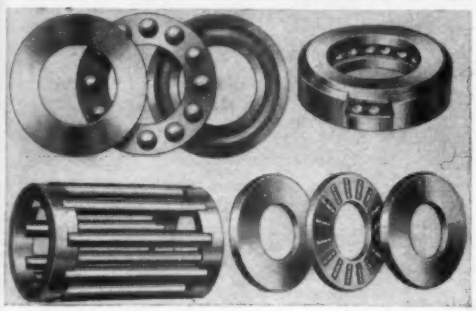
INDUSTRIAL PUMPS SERVE COUNTLESS WAR NEEDS

Tuthill Pumps are Serving Army • Navy Air Force Merchant Marine

For coolant, lubrication, hydraulic mechanisms, fuel oil and liquid transfer service, you can't top Tuthill Model L pump performance. These internal-gear, mechanically sealed, rotary pumps save space, material, time, maintenance and money. They are precision-built for peak performance in capacities from .33 to 3 g.p.m. at pressures up to 400 p.s.i Ring or foot mounted. Write for Small Pump Catalog.

TUTHILL PUMP COMPANY

939 E. 95th STREET • CHICAGO 19, ILLINOIS



B & R B

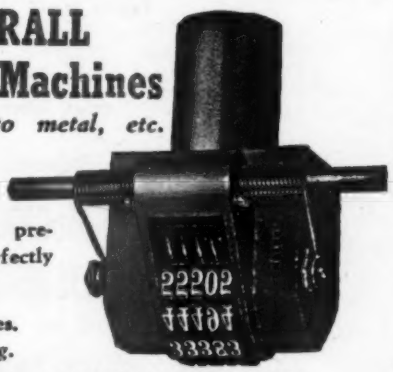
Precision Bearings have been recognized for many years for their dependability. These bearings can be selected from our catalog of standard sizes which are carried in stock.

THE BALL and ROLLER BEARING CO., Danbury, Conn.

NUMBERALL Numbering Machines

for stamping into metal, etc.

AUTOMATIC
MODEL NO. 50



Sturdy construction, precision build, perfectly aligned numbers.

All sizes of figures.
Write for Catalog.

NUMBERALL STAMP & TOOL CO.
Huguenot Park, Staten Island, N. Y.

ITEMS in post-war designs

First question up:— How compact can your new machine be designed? How much metal, how much weight can be saved over former designs? How much can you cut down flanges and projections to aid in streamlining?

The answer lies largely with the *fastenings* . . . Allen Hollow Screws set up flush in counterbored holes; no projections. They require less stock for flanges, lugs; smaller pockets for cover fastenings. Their greater strength allows smaller-size screws to be used.

Order samples of your local Industrial Distributor,— exclusive supplier of "ALLENS" in your locality.

THE ALLEN MFG. COMPANY
HARTFORD, ★ **ALLEN** ★ CONN.

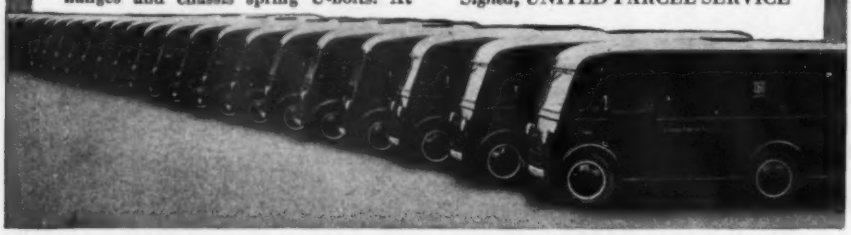
SIX MONTHS' TEST PROVES
Boots Nuts Eliminate Periodic Tightening

"The sample Boots Nuts which you supplied have now been in use on several of our vehicles, both light and heavy, for a period of six months.

We selected two difficult spots for their application, drive shaft universal joint flanges and chassis spring U-bolts. At these points plain nuts are not satisfactory unless a lock washer or jamb nut is used to hold them. Even so, they require periodic tightening.

The Boots Nuts in use have not required any attention since they were installed."

Signed, UNITED PARCEL SERVICE



A portion of the 2900-truck fleet of United Parcel Service trucks serving 16 metropolitan cities

THIS report of a test made by the country's outstanding consolidated delivery company, operating in sixteen cities, is a clear-cut indication of the economies that Boots All-Metal, Self-Locking Nuts will effect in the transportation field after victory.

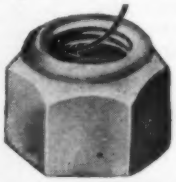
One piece, all-metal, Boots withstand the corrosive action of oil, water and chemicals. There's nothing to dry out, crack or shrink. Also, Boots Self-Locking Nuts can be used over and over without accelerated locking loss.

BOOTS SELF-LOCKING NUTS

"There's No Excuse for a Nut Shaking Loose"

Boots Aircraft Nut Corp. • General Offices, New Canaan, Conn.

The ALL-METAL lock is built in here



ROL-TOP. This style nut, now used on all types of aircraft engines, is the type of Boots All-Metal, Self-Locking Nut mentioned in the above letter.

MOVING?

If you plan to change the address to which your copies of AMERICAN MACHINIST are sent, let us know now. We don't—and we're sure you don't—want a single issue to be delayed in reaching you. Coupon below is for your convenience.

AMERICAN MACHINIST • 330 W. 42nd St., N. Y.

MY OLD ADDRESS

Name .....

Title .....

Company .....

Address .....

.....

MY NEW ADDRESS

Name .....

Title .....

Company .....

Address .....

.....

National
CLASSIFIED ADVERTISING

for bringing business needs or opportunities to the attention of other men associated in executive management, sales and responsible technical, engineering and operating capacities with the industries served by . . .

The SEARCHLIGHT SECTIONS

Classified Advertising

of these

McGraw-Hill publications

Air Transport
American Machinist
Aviation
Aviation News
Business Week
Bus Transportation
Chemical & Met. Engineering
Coal Age
Construction Methods
Electrical Contracting
Electrical Merchandising
Electrical World
Electronics
Engineering & Mining Journal
Engineering News-Record
E. & M. J. Markets
Factory Management & Maint.
Food Industries
Power
Product Engineering
Textile World

For advertising rates or other information, write:

Departmental Staff

McGRAW-HILL PUBLISHING CO., INC.
330 W. 42nd Street
New York 18, N. Y.

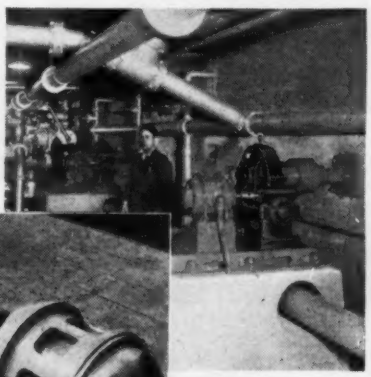
WE CERTAINLY MAKE A LOT OF DIFFERENT TYPES OF SPEED REDUCERS..

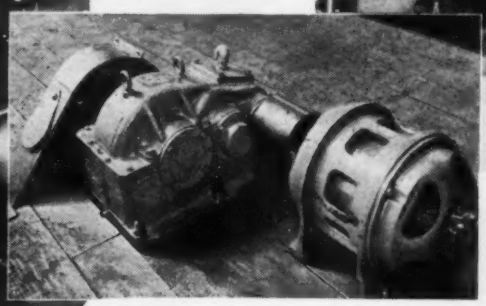
YES, THAT'S WHY WE CAN SUPPLY A DRIVE FOR EVERY NEED!

Long ago, experience showed that the many industrial drive applications could be filled best only from a full line of speed reducing units—therefore we designed and make all types and sizes. Furthermore, each unit is tailored to fit the service. In that way Philadelphia Speed Reducers transmit power efficiently and economically to all kinds of equipment and give years and years of trouble-free service.

Where a self-contained drive is indicated, we recommend the vertical or horizontal MotoReduceR.

Tell us your requirements and get our unbiased recommendations on the right type drive for your needs



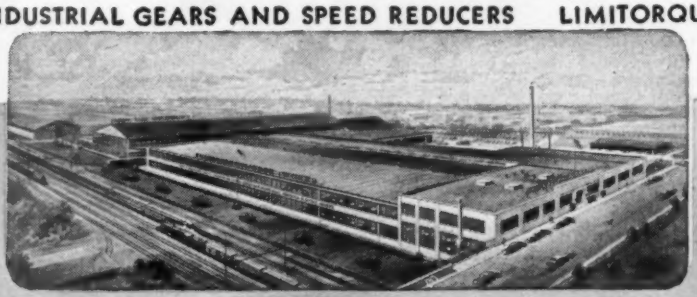


Shown here are 2 Philadelphia Speed Reducer installations.

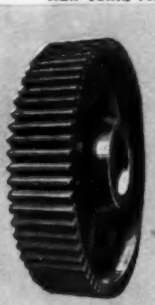
PHILADELPHIA GEAR WORKS, INC.

INDUSTRIAL GEARS AND SPEED REDUCERS LIMITORQUE VALVE CONTROLS

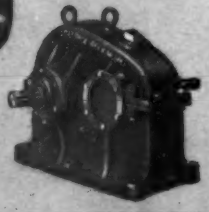
ERIE AVENUE & G STREET
PHILADELPHIA 34, PENNA.
NEW YORK, PITTSBURGH, CHICAGO



Philadelphia LIMITORQUE CONTROL operates all types of valves, etc., safely, economically, from convenient stations.



Philadelphia GEARS All types and sizes of industrial gears. Can be supplied in all materials.

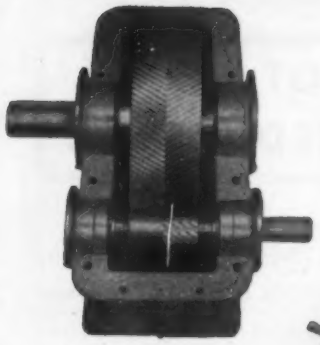


Philadelphia HERRINGBONE SPEED REDUCER for heavy loads at high speed. Single, Double, Triple Reductions, various ratios and horsepowers.

Philadelphia MOTOREDUCER The economical self-contained drive, Horizontal or Vertical types — various ratios and horsepowers.

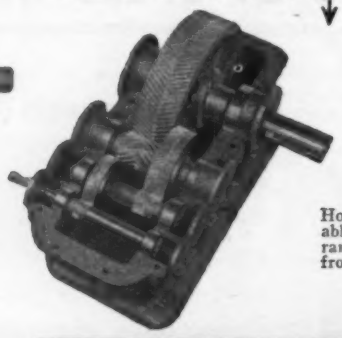
Philadelphia WORM GEAR SPEED REDUCER right angle drives — vertical or horizontal. Wide range of ratios and horsepowers.

PLANETARY REDUCERS



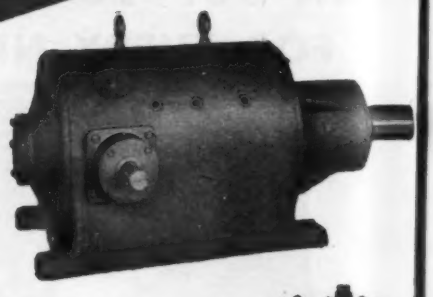
Single Reduction Continuous-Tooth Herringbone Gear Reducer
Available in 14 sizes, in a ratio range of 2 to 10:1, and from 1 to 1230 horsepower.

Double and Triple Reduction Continuous-Tooth Herringbone Gear Reducer
(Triple reduction illustrated below)
With offset shaft. Available in 24 sizes in a ratio range of 10 to 350:1 and from .63 to 380 h.p.

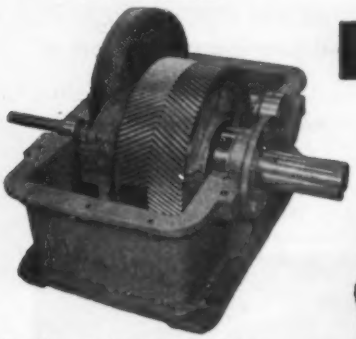


Planetary Gear Speed Reducer →
Horizontal drive. Available in 35 sizes in a ratio range of 10 to 1200:1 and from ¾ to 75 horsepower.

Right Angle Spiral Bevel Planetary Gear Speed Reducer
Horizontal drive. Available in 33 sizes in a ratio range of 8 to 1100:1 and from ½ to 75 horsepower.



HERRINGBONE REDUCERS



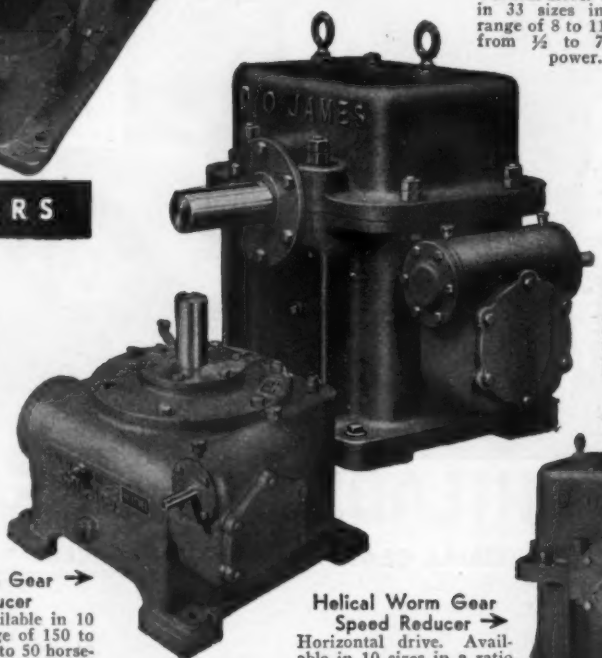
Double Reduction Continuous-Tooth Herringbone Gear Reducer
With straight-line drive. Available in 12 sizes in a ratio range of 10 to 75:1 and from 1 to 500 horsepower.

← Right Angle Spiral Bevel Herringbone Gear Reducer
Available in 11 sizes in a ratio range of 6 to 45:1 and from 1 to 250 horsepower. Horizontal and vertical drive. (Horizontal drive illustrated.)

Right Angle → Spiral Bevel Planetary Gear Speed Reducer
Vertical drive. Available in 33 sizes in a ratio range of 8 to 1100:1 and from ½ to 75 horsepower.

WORM GEAR REDUCERS

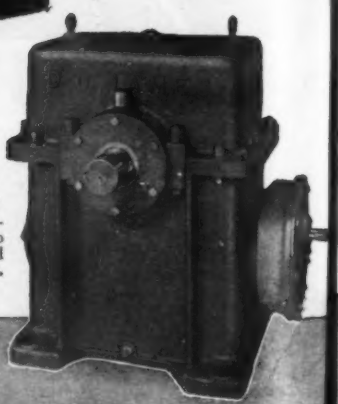
Type M Worm Gear ←Speed Reducer
Horizontal drive, worm bottom or top, or vertical drive. Available in 48 sizes, in a ratio range of 8.5:1 to 240:1 and from .01 to 42 horsepower.



Double Worm Gear ← Speed Reducer
Horizontal drive. Available in 10 sizes in a ratio range of 150 to 8100:1 and from ⅛ to 50 horsepower.

Double Worm Gear → Speed Reducer
Vertical drive. Available in 10 sizes in a ratio range of 150 to 8100:1 and from ⅛ to 50 horsepower.

Helical Worm Gear Speed Reducer →
Horizontal drive. Available in 10 sizes in a ratio range of 60 to 240:1 and from ¾ to 66 horsepower.

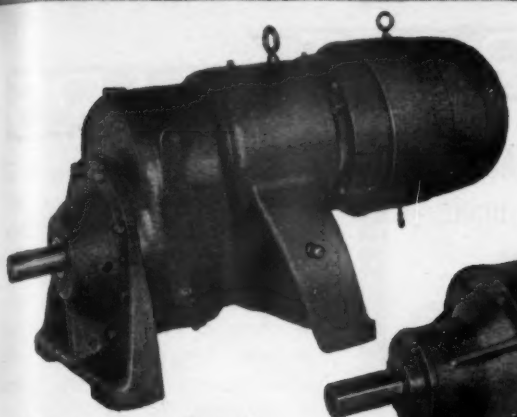


Type "H" Worm Gear Speed Reducer
Horizontal drive. Worm bottom or top. Available in 26 sizes in a ratio range of 6 to 65:1 and from ⅓₂ to 150 horsepower.

Type "H" Worm ↑ Gear Speed Reducer
Vertical drive. Available in 13 sizes in a ratio range of 6 to 65:1 and from ⅓₂ to 150 horsepower.

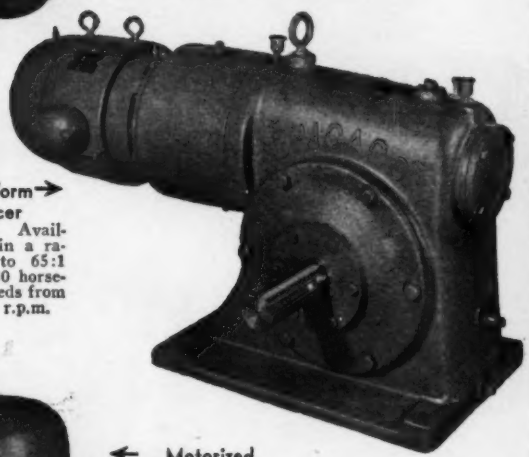
Helical Worm Gear→ Speed Reducer
Vertical drive. Available in 10 sizes in a ratio range of 60 to 240:1 and from ¾ to 66 horsepower.

Your power saving requirements are capably handled by an organization making every type of gear reducer.



Motorized Helical Reducer
Horizontal drive. Available in 8 sizes in a ratio range of 1¼ to 9:1 and from ¾ to 50 horsepower. Driven speeds from 1458 r.p.m. to 128 r.p.m.

← **Motorized Planetary Reducer**
Horizontal drive. Available in 35 sizes in a ratio range of 10 to 1200:1 and from ¾ to 75 horsepower. Driven speeds from 172 r.p.m. to .74 r.p.m.

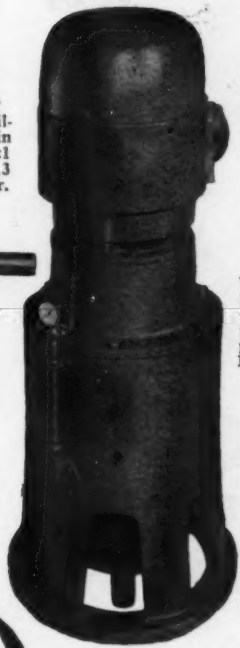


Motorized Worm → Gear Reducer
Horizontal drive. Available in 11 sizes in a ratio range of 6 to 65:1 and from ¼ to 30 horsepower. Driven speeds from 310 r.p.m. to 25 r.p.m.

MOTORIZED REDUCERS

Motorized Worm ← Gear Reducer
Vertical drive. Available in 11 sizes in a ratio range of 6 to 65:1 and from ¼ to 30 horsepower. Driven speeds from 310 r.p.m. to 25 r.p.m.

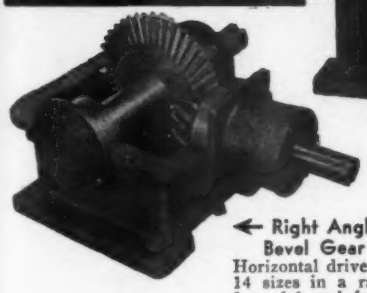
Right Angle Spiral Bevel ← Gear Reducer
Vertical drive. Available in 14 sizes in a ratio range of 1:1 to 6:1 and from .3 to 275 horsepower.



← **Motorized Planetary Reducer**
Vertical drive. Available in 35 sizes in a ratio range of 10 to 1200:1 and from ¾ to 75 horsepower. Driven speeds 172 r.p.m. to .74 r.p.m.

Motorized → Helical Reducer
Vertical drive. Available in 8 sizes in a ratio range of 1¼ to 9:1 and from ¾ to 50 horsepower. Driven speeds 1458 r.p.m. to 128 r.p.m.

BEVEL GEAR REDUCERS



← **Right Angle Spiral Bevel Gear Reducer**
Horizontal drive. Available in 14 sizes in a ratio range of 1 to 6:1 and from .3 to 275 horsepower.

Send for Complete Catalog

D.O.James

MANUFACTURING COMPANY

ESTABLISHED 1888

1140 W. MONROE ST., CHICAGO, U. S. A.

MAKERS OF EVERY TYPE OF GEAR AND GEAR REDUCER

In base to plane communication one of the vital contributing factors toward the accuracy of pin point tuning is precision gears, and we are proud to say that QUAKER CITY GEARS are playing their part in assuring this accuracy.

Quaker City Gear Works
INCORPORATED

1910-32 NORTH FRONT STREET, PHILADELPHIA, PENNSYLVANIA

GRANT GEARS

"64 YEARS" MANUFACTURING GEARS

Despite the continued growth of our gear business we are still in position to give each customer the attention they have a right to expect.

We carry a complete stock of standard cut gears and can furnish special gears to your specifications.

GRANT GEAR WORKS
BOSTON, MASS.

ESTABLISHED 1877 · GEAR · BY GEO. B. GRANT

Gear Specialties

SPURS • HELICALS • BEVELS
(Straight & Spiral)
WORM GEARING • THREAD GRINDING
(14 to 96 D. P.)

This range logically embraces the gear components of many critical control devices essential to the war effort and this organization is proud of its contributions of such material in the program.

With full production capacity scheduled far into the future, all new inquiries are now necessarily subordinated to these vitally important prior commitments. However, every urgent need will be given careful consideration.

Gear Specialties
MANUFACTURERS
CHICAGO

2600 W. Medill Av. Ph. Hum. 3482

This internal gear goes into a four wheel drive. SIER-BATH is producing many such gears for this service where the equipment in which they are used gets rough treatment. Such gears must be tough to stand the gaff without failing. So SIER-BATH toughens them by a heat-treating process in which the most modern and precision-controlled equipment is employed. Exact hardening to rigid metallurgical requirements is definitely assured.

Precision in machining is also a SIER-BATH requirement. That is why this modern plant, specializing on the production of high quality gears, is equipped with only the very latest types of gear-making machine tools and why precision gears can be produced promptly in quantity to exacting requirements.

●

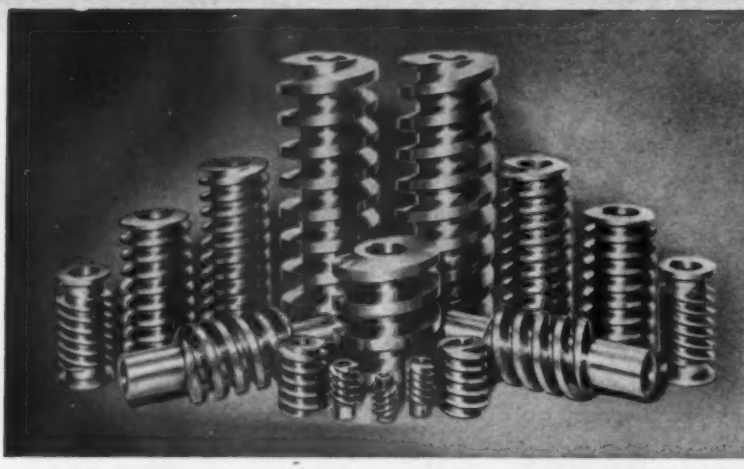
SIER-BATH can produce precision gears promptly in sizes from 2" to 52". *Submit your specifications for quotations.*

SIER-BATH GEAR CO.

9254 HUDSON BOULEVARD — NORTH BERGEN, N. J.

Incorporated

The Doorway to 38 years experience in making Precision Gears



ADAMS GEARS

SPUR — HELICAL — WORM
BEVEL — MITER — RACKS

Splined Shafts A Specialty

THE ADAMS COMPANY
Est. 1883
1942 Bridge St. Dubuque, Iowa

BEVEL GEAR RATIO
can be changed by merely changing the pinion.

BILGRAM GEAR & MACHINE WORKS
1217-35 Spring Garden, Philadelphia, Pa.

GANSCHOW GEARS

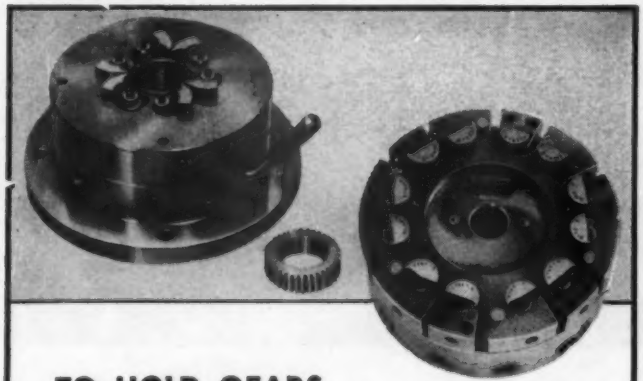
FOR SIXTY YEARS

Spur—SPEED REDUCERS—Worm
ALL TYPES OF CUT GEARS
GANSCHOW GEAR CO., 18 N. Morgan St., Chicago

BRAWNY GEARS

PROMPT
ECONOMICAL SERVICE
ALL TYPES, MATERIALS
AND QUANTITIES
Ask for Estimate

BRAUN GEAR CO., 1590-1608 Atlantic Ave., Brooklyn, N. Y.



TO HOLD GEARS
with precision for boring or grinding
HAVE TEETH GRIPPED ON LINE OF ACTION
Principle used only in

MATCH-IT GEAR CHUCKS

Method eliminates distortion. Gears have perfect, round holes. Made for internal and external gears, for spur and helical gears, and for countershaft type gears.

Send for catalog

LeMaire Tool & Manufacturing Co.
2665 So. Telegraph Rd., Dearborn, Mich.

FOR THE PRODUCTION OF PRECISION GEARS—Gears of every type from 5/16" to 16" produced from any material exactly to your specifications. Write today for a quotation on your precision gear work.

DETROIT BEVEL GEAR COMPANY
8132 JOSEPH CAMPAU AVE. • DETROIT 11, MICH.
Makers of Quality Gears for 30 Years

Gears built to take a beating...

AND LIKE IT!

Gears for a forging rotator must withstand impact and stress not encountered in ordinary service. They must not fail. Only quality gears have the stamina *plus* to stand up under such abusive service. Earle Gears have this *plus* quality.

Earle Gear facilities and experience in making spur gears from 1″ to 30 feet in diameter, bevel gears up to 13 feet and worm gears of any practical size, may be the answer to filling your gear requirements. For details, write for Bulletin 42-B.

The EARLE GEAR & MACHINE CO.
4723 STENTON AVE., PHILADELPHIA 44, PA.

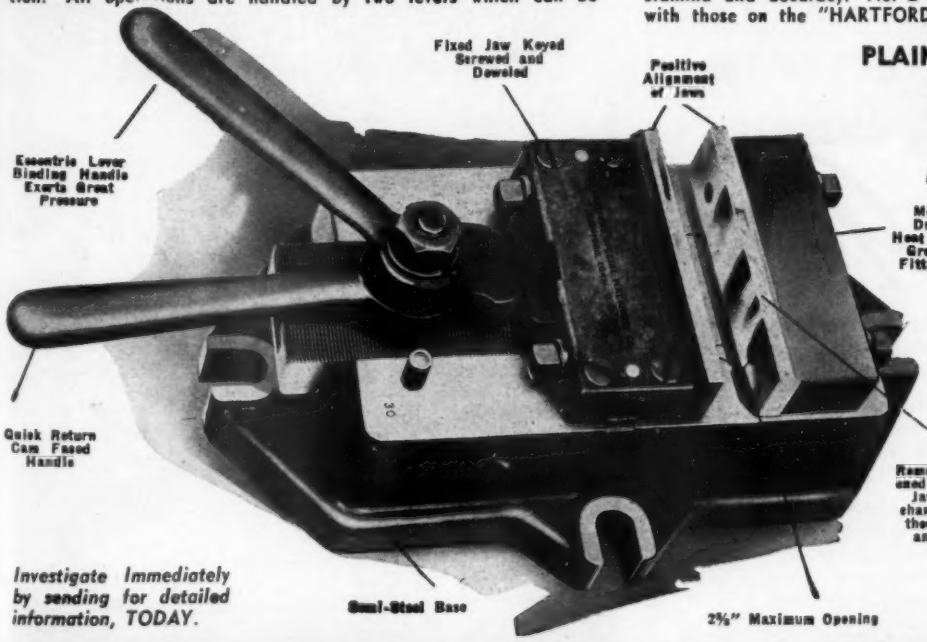
EARLE GEARS

SALES OFFICES:
149 Broadway, New York 6, N. Y.
901 Davis Avenue Pittsburgh 12, Pa.

THE HARTFORD QUICK ACTING VISE...

is a tool to speed production milling...

Quick opening and return combined with great holding power are features of the "HARTFORD" which assure speed up in production. All operations are handled by two levers which can be manipulated easily by one hand. Jaw alignment is positive; jaws are one-piece drop forged, heat treated and ground for long-lived stamina and accuracy. No. 2 B&S Vise false jaws interchange with those on the "HARTFORD."


Fixed Jaw Keyed Screwed and Doweled
Positive Alignment of Jaws
Eccentric Lever Binding Handle Exerts Great Pressure
Movable Jaw Drop Forged Heat Treated and Ground on all Fitting Surfaces
Quick Return Cam Faced Handle
Removable Hardened and Ground Jaws. Interchangeable with those of No. 2B and S. Vise
Semi-Steel Base
2⅝" Maximum Opening

PLAIN and SWIVEL JAW TYPES

Jaw with — 5″
Jaw depth — 1 3/16″
Max. opening (Plain Jaw)
Jaws in place—2⅝″ — 2⅝″
Jaws removed — 3½″
Max. opening — (Swivel Jaw)
Jaws in place — 2¼″
Weight — 40#
Length — 13″
Width — 8″
Height — 5″

Investigate Immediately by sending for detailed information, TODAY.

THE HARTFORD SPECIAL MACHINERY CO., Hartford, Connecticut

GET YOUR QUOTATION
***from* "HARTFORD"**

GEARS of every description cut to order

GEAR, CAM and THREAD grinding

AERONAUTICAL PARTS on contract basis

Send blue prints or samples for estimate. Accuracy of work guaranteed to your specifications.

THE HARTFORD SPECIAL MACHINERY COMPANY
HARTFORD CONNECTICUT

EACH GEAR
A MASTER GEAR

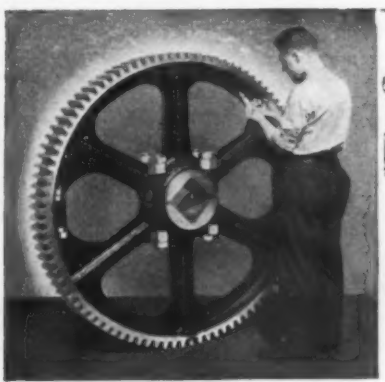
and the way MEISEL builds gears, there's just one *right* gear for any specific job. Designed for use under conditions that exist, MEISEL Gears actually "belong" to a machine . . . are inherently able to give longer, quieter, more economical service. Investigate the advantages of *specifically* engineered gears by MEISEL.

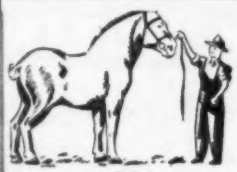
MEISEL PRESS MFG. CO.
946 Dorchester Ave. Boston, Mass.

GEAR CUTTING MACHINES

New Design
New Features
New Advantages

NEWARK GEAR CUTTING MACHINE CO.
69 Prospect Street, NEWARK 5, NEW JERSEY
FRANK E. EBERHARDT, *President*





AN OUT OF THE ORDINARY

WELL-BUILT Gear

Ability to handle those big, difficult, out-of-the-ordinary gear jobs with ease means that it's just plain horse sense that Stahl can go to town in meeting ordinary requirements.

However, Stahl gives the same careful attention to all specifications for gears, large or small. Our modern facilities enable us to produce many types of gears and of any material—AT PRICES WHICH WILL INTEREST YOU.

STAHL GEARS

Just send us blueprint or specifications of the gear or gears you require. Ask us to quote. You'll find that Stahl will save you money as well as serve you efficiently.

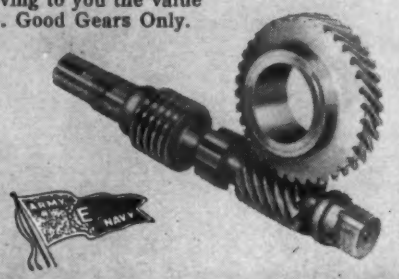
THE STAHL GEAR & MACHINE CO.
CLEVELAND OHIO

CINCINNATI GEARS
Consistently
PROVE THEIR VALUE

Cincinnati Gears are precision gears. Through the use of many modern, newly designed tools and test instruments, skilled Cincinnati Gear craftsmen have set remarkable records for exactness and close control.

Our forty years of experience and "KNOW HOW" may help you in solving your gear problem. We welcome an opportunity of proving to you the value of Gears . . . Good Gears Only.

★ SPUR
★ SPLINE
★ HELICAL
★ WORM
★ BEVEL
★ SPECIAL



THE CINCINNATI GEAR COMPANY
"Gears . . . Good Gears Only"
Wooster Pike and Mariemont Ave. ★ Cincinnati 27, Ohio

TORSIONAL FORMING PRESS

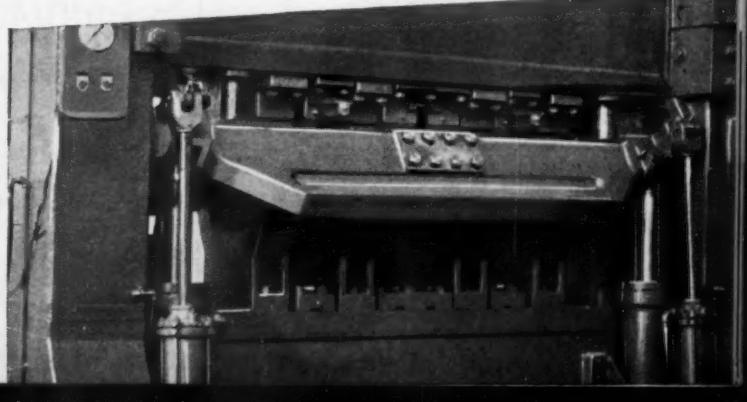
A new, high speed method of positioning the throws of crankshafts is provided by this Clearing Hydraulic Press. The press offers many advantages, the most important being (1) bends produced in forging operations are accurately straightened; (2) crank pins are turned to correct positions in one fast operation; (3) crankshaft is rigidly and completely held during the entire forming operation to assure accuracy of twist and maintain perfect alignment; and (4) work is easy to load and unload since dies open to full length of work, and knockouts automatically loosen finished work.

The dies of this press receive a forged alloy steel crankshaft, with all the crank pins in one plane. The press as designed may be adjusted for twisting any six-pin crankshaft, where the crank pins and cheeks must be correlated to the conventional angularity of 120°. The bed is 90" long and die shoes are longitudinally adjustable to accommodate die inserts for any crankshaft up to 66" in length.

While your production may not concern crankshafts, this particular press is a good example of Clearing's willingness and ability to tackle and solve any problem presented. If you have a production operation, whether commonplace or unusual, where presses may be required, your inquiry is invited. Experience proves you can consult Clearing with confidence. Clearing Machine Corporation. 6499 West 65th Street, Chicago 38, Illinois

Patent Pending

An assembly of four stationary and three rotating dies (below) hold the crankshaft and turn the crank pins. The stationary dies straighten and clamp the crankshaft under 250 tons pressure and maintain the forged position of one pair of crank pins. The rotating dies twist the other two pairs of crank pins. Controlled by a beam (below, right) on the front of the press, the center rotating die twists the center pair of crank pins 60°. The other two rotating dies, controlled by a beam on the back of the press, twist the remaining pair of pins 60°, so that 120° intervals exist between the three pairs of crank pins. The two beams are pivoted at their ends on common shafts which align with the centerline of the dies and work. Die design and knockouts permit easy removal of work. Pneumatic and hydraulic controls return dies to open and neutral positions, ready for a new work cycle.



TUBE CUTOFF OPERATIONS?

HANDLE THEM

FASTER...

MORE ACCURATELY...

WITH THE NEW

ETNA

TUBE CUTOFF MACHINE

- **Completely automatic**
- **Hydraulic finger-tip control**
- **Smooth, infinite range of spindle speeds**
- **Entirely self-contained**
- **Easily operated — no experience needed**
- **Dial-controlled feed and speed adjustment**

● The new ETNA Tube Cutoff Machines are entirely self-contained units. Drive motor, hydraulic pump and motor, hydraulic cylinders . . . all moving parts . . . are mounted within the safe base with rotating cutter head. Tubes are held stationary while being cut. The spindle, on which the tool holders are fastened, is mounted on Timken tapered roller bearings and is V-belt driven by a Louis-Allis "Adjusto Speed" Motor. Machines are built in capacities to cut tube ranging from 1/2" O.D., 1/8" Wall up to 12" O.D., 1 1/2" Wall. Units to handle tube of over 5" O.D., 1/2" Wall are built to your order.

Write for full details on the new ETNA Tube Cutoff Machine! Complete operating and construction data will be sent at your request.

Machine with cover removed, showing tube in position to be cut off.

IF IT'S A QUESTION OF TAPERING, SIZING OR REDUCING OF ROUND SOLIDS OR TUBING

"Ask ETNA about Swaging"

The ETNA *Machine Company*

3400 MAPLEWOOD AVENUE

TOLEDO 10, OHIO

How to Maintain a Constant Power Supply for HYDRAULIC EQUIPMENT That will *"Step-up"* Production and Lower Costs

ELMES PISTONLESS-TYPE, AIR-BALLASTED, HYDRAULIC ACCUMULATOR

Patented. Modern, efficient, reliable . . . requires minimum floor space, no special foundation. Foolproof design and construction give a constant flow of power, always.

THE Elmes pistonless-type, air-ballasted accumulator is today's most efficient method of storing liquid under pressure; and, within specific predetermined pressure limits, it gives a constant power supply. The effectiveness of this unit is the result of over 50 years' experience in the design and construction of accumulators. As a result, Elmes installations in scores of the leading plants of the U. S. and Canada are today rendering uninterrupted service. These are the advantages an Elmes air-ballasted accumulator will bring to you:

ELIMINATES LINE SHOCKS! The compressed air, used to maintain pressure on the column of liquid, serves as a shock absorber and thus eliminates line shocks.

CLOSER PRESSURE REGULATION! The pressure variation from the high to low point of the liquid column is definitely controllable by the volume in the air chamber.

SAVES FLOOR SPACE! Because pressure vessels are not large in diameter and since no large ballast tank or platform is required, there is a definite saving in floor space.

NO INTERNAL MOVING PARTS OR PACKINGS! There are no pistons or internal moving parts to be maintained because compressed air acts directly on the column of liquid.

EASY TO INSTALL! Elmes air-ballasted accumulator requires no special, heavy foundation. Pressure vessel, or vessels, are quickly and easily set in place on the ordinary factory floor.

VARIABLE PRESSURE ACCUMULATORS are also available with pressure changes attained by simple fingertip controls.

Consult the Elmes Engineering Staff for a solution to any hydraulic power problem with which you are confronted. Or, write for a FREE copy of this late bulletin on accumulators. It describes their design, construction, safety features, electrical controls, etc.

ELMES ENGINEERING WORKS *of* AMERICAN STEEL FOUNDRIES, 1001-1013 Fulton St., Chicago 7, Illinois

ELMES HYDRAULIC EQUIPMENT

Also Manufactured in Canada

METAL-WORKING PRESSES · PLASTIC-MOLDING PRESSES · EXTRUSION PRESSES · PUMPS · ACCUMULATORS · VALVES · ACCESSORIES

famco Announces

A BRAND NEW LINE OF FOOT-POWERED SQUARING SHEARS

MADE IN FIVE SIZES

Famco proudly presents a new, highly efficient, foot-powered squaring shear . . . the result of many months of designing, engineering and testing . . . available in 22", 30", 36", 42" and 52" cutting widths.

● If you need a squaring shear, it will pay you to investigate the latest thing on the market. Famco has developed a new, low cost, foot-operated (motorless) machine that's extremely powerful . . . will cut up to 18 gauge mild steel.

This machine is ruggedly built of semi-steel, accurately machined. The cross-head is reinforced with a steel tie rod for proper knife alignment and accurate shearing. Compressing springs are encased to practically eliminate their breakage. Knives have tool steel cutting edges.

Fast, accurate depth setting is accomplished with back gauges moved on heavy support rods by means of graduated racks and pinions. All models are equipped with front, back and side gauges. The "hold-down" attachment is furnished with the 36", 42" and 52" sizes.

Write for information and prices on this inexpensive, efficient new line of shearing machines.

FAMCO MACHINE COMPANY

1316 - 18th STREET • RACINE, WISCONSIN

Famco builds 32 models of bench and floor type arbor presses that deliver from ½ to 15 tons pressure.

Famco Foot Presses are made in 10 sizes, for bench or stand mounting . . . save cost of power presses.

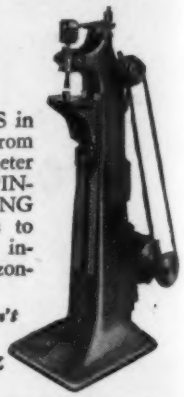
famco

ARBOR PRESSES • FOOT PRESSES • SQUARING SHEARS

GRANT

RIVETERS — PIONEERS in their line—head rivets from smallest to ⅝" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.



THE GRANT MFG. & MACHINE CO.

85 Silliman Ave., Bridgeport, Conn., U. S. A.

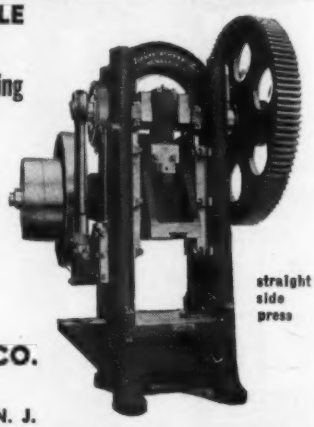
STRAIGHT SIDE SINGLE CRANK PRESSES

for heavy blanking and forming

Heavier classes of blanking and forming work can be handled efficiently and economically on these presses.

Sturdily constructed with either solid frame or built up with tie rods. Small elastic deflections do not affect tool alignment. All stresses taken centrally. Made also with wedge adjustment for slide for very close work.

Full details on request.



straight side press

ZEH & HAHNEMANN CO.

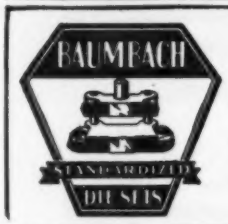
180 Vanderpool Street

NEWARK N. J.

PRESSES
FEEDS
AUTOMATIC EQUIPMENT

THE V&O Press Co.

HUDSON N Y



BETTER-MADE

DIE SETS

AT LOWER COST

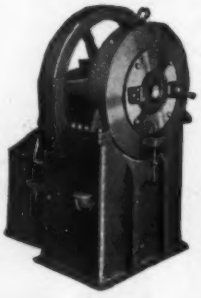
46 Styles—195,000 Sizes

E. A. BAUMBACH MFG. CO.

Machined Steel Semi-Steel

Send for our new catalog

1812 South Kilbourn Ave., Chicago, Ill.



THE

TORRINGTON

ROTARY

SWAGING MACHINE

— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

The Torrington Co., Swager Dept.

56 Field Street Torrington, Conn.

Cleveland
STEELWELD BULLDOZERS

FOR HEAVY POWER REQUIREMENTS

Truck braces made in three operations of .40 carbon steel 2 x 3-inch cross section bent to 5½ inches inside radius. No. 6 Bulldozer.

Bending heavy steel channels to 120 degree angle with top and bottom flange remaining at right angles to web. No. 4 Bulldozer.

Bending and forming a bead in flat pieces of dural for fuel tanks. No. 4 Bulldozer.

Cleveland Steelweld Bulldozers are especially advantageous for the bending and forming of heavy bars and plate, for forging and other work requiring tremendous power. By use of special tools and dies a variety of unusual operations can be performed. Crankshafts and refrigerator cabinets are examples of special work that are produced fast and economically on Steelwelds.

Because the frames are of the all-welded steel construction, far greater strength and rigidity are obtained for the weight of metal used than otherwise possible. Metal is incorporated exactly where the greatest good is accomplished. The frames have no bolted connections to loosen and cause misalignment. Strains are not confined to any single part, but are absorbed by the frame as a whole.

Every working part — drive gears, clutch, brake, ram and slides — have been especially designed to give extra long life and withstand abnormally hard service and even abuse. The splendid record of Cleveland Steelwelds since the first machine was built in 1930 attest to the quality of their construction.

THREE OF THE MOST POPULAR SIZES*

Model No.	Tons Capacity		Face of Ram	Height of End Lugs	Die Space With Ram Forward	Travel of Ram	Strokes Per Minute	Floor Space Required
	Mid Stroke	Bottom Stroke						
4	40	80	9″x56″	8½″	36″	18″	14	5′ 2″x12′ 9″
6	70	140	12″x64″	12″	42″	20″	11	6′ 2″x15′ 4″
8	110	220	18″x80″	16″	54″	24″	10	7′ 4″x19′ 0″

*Data on other sizes furnished upon request.

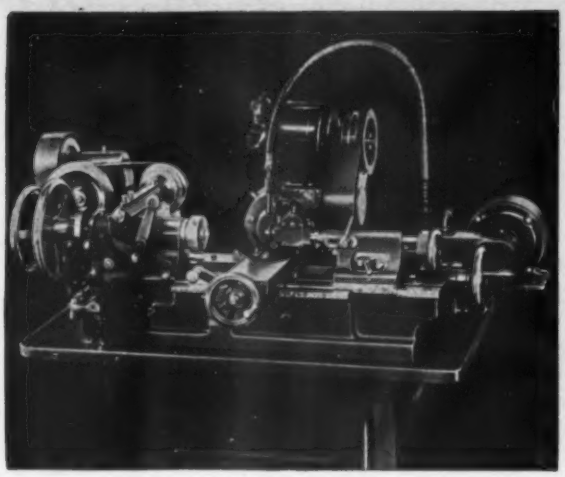
Descriptive literature gladly furnished free upon request.

THE CLEVELAND CRANE & ENGINEERING CO.

1127 EAST 283RD STREET • WICKLIFFE, OHIO.

CLEVELAND
STEELWELD BULLDOZERS

GENERAL SALES AGENTS: THE CYRIL BATH CO., E. 70TH & MACHINERY AVE., CLEVELAND

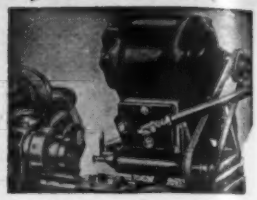


STANDARD THREAD FORMS

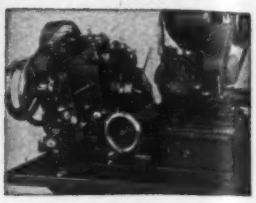
Quickly and Accurately milled . . .

ON

WALTHAM THREAD MILLERS



Waltham Thread Miller equipped with Internal Threading Attachment



Machine equipped with Relieving Attachment

■

Write for literature giving complete details and specifications.

SPECIFICATIONS

Swing over carriage 3"
Capacity (Diameter of work) 2" or smaller
Thread length (work held on centers) 8¾"
Thread length (work held in spring chuck at one end) 10"
Diam. hole through spring chuck ⅝"
Diam. hole through work spindle ¾"
Floor space 48" x 34"
Motors: 1/3-¼ and 1/6 HP.

Precision threading is put on a production basis by these fast, convenient, accurate Waltham machines. Cutters are available for all standard thread forms.

Machine is equipped with three motors—for speed, feed and oil. Individual speed change and reverse are provided for cutter and work. Motor speeds, controlled from a convenient central point, are available for cutting brass or steel.

A wide range of extra equipment and attachments can be furnished for extending the usefulness of this machine.

WALTHAM MACHINE WORKS

WALTHAM MASS.

WALTHAM TRADE MARK REGISTERED U S PAT OFF

DON'T WAIT FOR TURRET LATHES

Convert your engine lathe into a turret lathe in 15 seconds. To fit Bench lathes and lathes up to 24" swing. Designed to increase production. 6 DAYS DELIVERY.

The 4-Tool Tool-Post Turret is made in 2 sizes. The 5-Tool Tail-Stock Turret is made in 4 sizes. Also Adjustable Pull Feed—easily attached. All tools are precision attachments. Write for further details.

Pat. Pending

5-Tool Tool-Stock Turret

4-Tool Tool-Post Turret

"Jefferson Turrets are real production tools — substantial, rigid, accurate and adaptable to any size or make of engine lathes. They must not be confused with the small makeshift gadgets now on the market."

Also — Jefferson Precision Milling Machines, Milling Machine Dividing Heads, Vises, Belt Sanders, Swing Frame Grinders, Gyratory Foundry Riddles

JEFFERSON MACHINE TOOL CO.

90. SWEENEY, SUTTER & FOURTH STS., CINCINNATI, OHIO

Die-Making Machines

They save 50% on sawing, filing and lapping operations, easily maintaining .002" limits. Ask for special bulletin —also circulars on Drill pointers. Point Thinners, Mill cutter Grinders and Tap Grinders.

OLIVER OF ADRIAN PRODUCTS

Oliver Instrument Co., 1414 Maumee St., Adrian, Mich.

ROCKFORD MACHINE TOOL CO.

Hy-Draulic

Shapers . . Planers . . Slotters . . Shaper-Planers

— ROCKFORD, ILLINOIS, U. S. A. —

Metal Stampings

"DUPLICATED WITHOUT DIES"

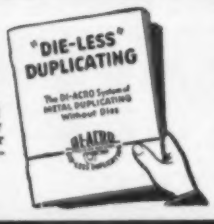
SHEARS

BRAKES

BENDERS

Send for Catalog "Die-Less Duplicating"

It illustrates many stampings or parts made without dies, gives full details on DI-ACRO machines and shows how they may readily be adapted for various applications. Request your copy now.



If you desire to save time and critical materials on production of metal stampings or other small parts, then the DI-ACRO System of "Metal Duplicating Without Dies" merits your consideration. It is based on the rapid and accurate production of formed parts with DI-ACRO Shears, Brakes and Benders. All duplicated work is accurate to .001". These precision machines are adaptable to an endless variety of work, and ideally suited for use by girl operators. For short runs your parts are processed in a matter of hours instead of waiting weeks for dies.

DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING

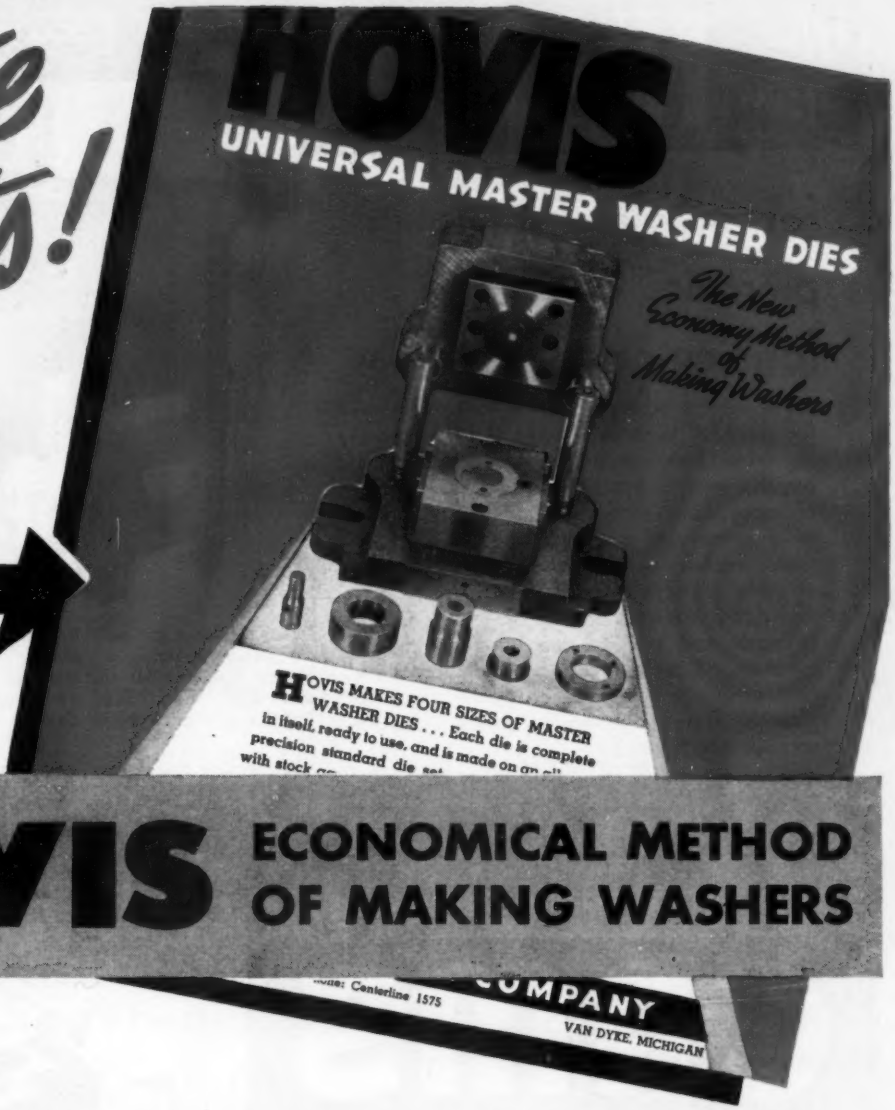
O'NEIL-IRWIN MFG. CO.

311 EIGHTH AVENUE SOUTH
MINNEAPOLIS 15, MINNESOTA

Get the Facts!

SEND FOR THIS NEW FOLDER

DESCRIBING AND ILLUSTRATING IN DETAIL


HOVIS
UNIVERSAL MASTER WASHER DIES
The New Economy Method of Making Washers
HOVIS MAKES FOUR SIZES OF MASTER WASHER DIES . . . Each die is complete in itself, ready to use, and is made on an all-
precision standard die set
with stock
COMPANY
VAN DYKE, MICHIGAN

The HOVIS ECONOMICAL METHOD OF MAKING WASHERS

LEARN all about this sensational new way of making washers that is now so widely adopted among the big industrial firms of America. No longer is it necessary to go to the expense of making a complete compound die for each new washer. Use the Hovis advanced method, consisting of a die complete in itself, ready to use, made on an all-steel precision standard die set which comes complete with gauges and stops. From these dies you can remove five small interchangeable parts without dismantling the die. Once your initial investment is made in Master Washer Dies of the sizes to fit your needs, FIVE SMALL INTERCHANGEABLE PARTS ARE ALL THAT IS NECESSARY TO BUY TO MAKE ANY SIZE WASHER. This simple method means a big saving in materials and labor. It eliminates all process engineering, tool designing, tool making and tool try-out.

HOVIS
SCREWLOCK CO
8098 E. Nine Mile Road
Van Dyke Michigan
Suburb of Detroit - Phone Centerline 1575

Mail The Coupon!

HOVIS SCREWLOCK COMPANY
8098 E. Nine Mile Road, Van Dyke, Michigan

Please send me your new illustrated folder showing "The HOVIS WAY" of making washers.

My name is.....

Company .....

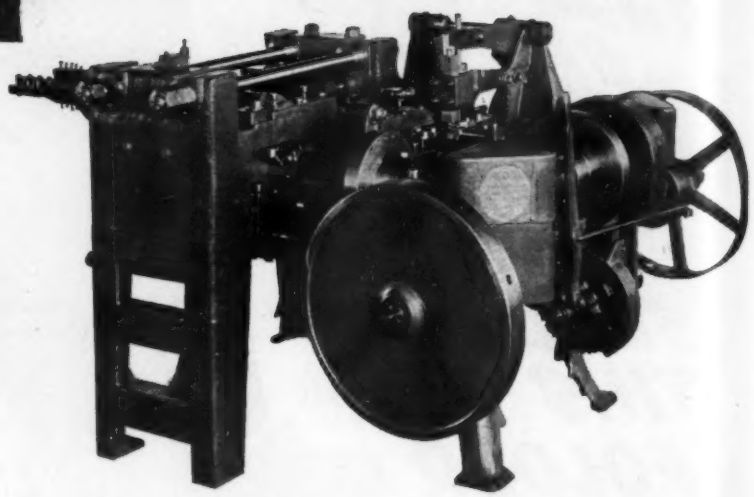
Address .....

City..... State.....

The New NILSON AUTOMATIC PRESS and FOUR SLIDE MACHINES

for swaging, stamping, piercing, blanking, forming of coiled metal

These new machines built in two models—for general purpose, heavy duty fabricating metal forming—provides a capacity far beyond what is practical to accomplish with ordinary cam motion. The new NILSON is a combination power press and four slide machine with powerful silent action of main press slide operated by crank motion through toggle or knuckle joints. Great strength and rigidity are inherent in this machine. Die sets are readily accessible and easily removable. No obstruction to view is offered and tools can be adjusted without interference.



These machines are built in 2 sizes—for forming from 3/16" and ¼" diameter wire and for flat material 2" and 2½" wide. Send for 4-page bulletin giving complete details.

As specialists in the design and construction of special automatic machinery of all kinds, we are in position to render a complete service on this class of work. Consult Nilson on your special requirements.

THE A. H. NILSON MACHINE CO...Bridgeport, Conn., U.S.A.

CAMS

LET the largest, most completely equipped cam milling plant in the mid-west handle your cam problems. All sizes of drum, face, groove or other styles of cams cut to order in quantities of one or one thousand. Send specifications or blueprints for a quotation on your requirements.

KUX MACHINE COMPANY
3930-44 W. HARRISON, ST. CHICAGO, ILL.

DANLY
PRECISION DIE SETS
DANLY MACHINE SPECIALTIES, INC.
2100 S. 52nd Avenue, Chicago, Ill.
MILWAUKEE • LONG ISLAND CITY, N. Y.
DAYTON • DETROIT • ROCHESTER
CLEVELAND • PHILADELPHIA
Bucommon Metals & Supply Co.
Los Angeles • San Francisco

THEIR PRECISION
Means Greater Accuracy In Your Production
Danly Commercial Sets
Danly Special Sets
DANLY
DIEMAKERS' SUPPLIES

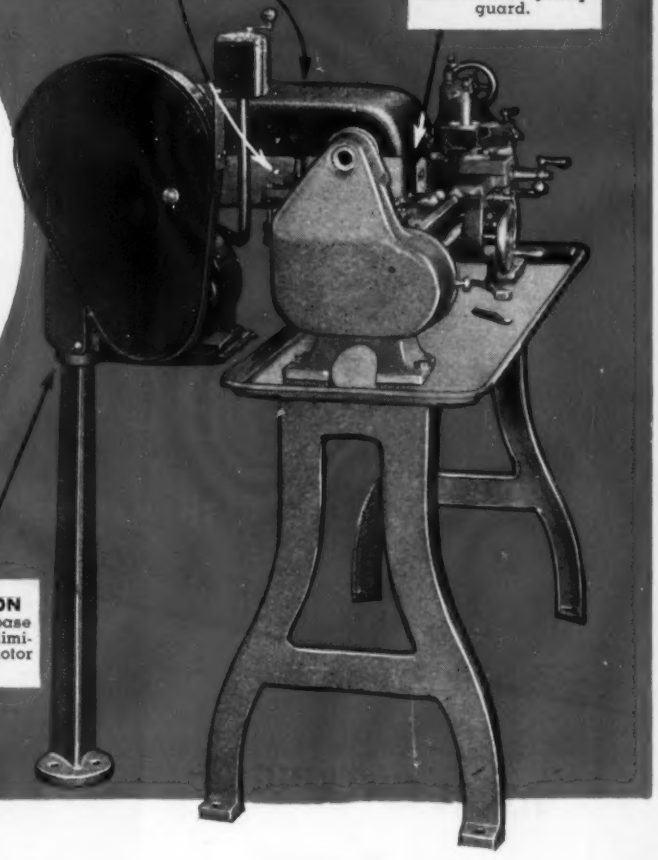
NEED CONTRACT WORK?

Investigate the possibilities offered you through advertising in the CONTRACT WORK SECTION!

For details, write

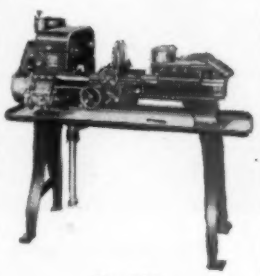
DEPARTMENTAL STAFF
American Machinist, 330 W. 42nd St., New York 18, N. Y.

RUBBER CUSHIONED COUNTERSHAFT and 3-POINT SUSPENSION


TWO RUBBER CUSHIONED BEARINGS, one at each of the two hinge points connecting countershaft and headstock, absorb motor vibration.
TWO RUBBER BUTTONS cushion cone pulley guard.
ONE RUBBER CUSHION between motor mounting base and pedestal further eliminates transmission of motor vibration.

BRIEF SPECIFICATIONS

Swing over bed, 10½"... bed length, 43⅛"...spindle hole, $\frac{25}{32}$"...capacity, ⅝" with push type collet...6-position automatic indexing turret . . . stroke of turret, 4¼"...12 spindle speeds from 30 to 1450 r.p.m.... moving parts protected by ball bearings or self-lubricating bronze bearings.



No. 840
Quick Change Gear Turret Lathe with automatic apron

motor vibration absorbed

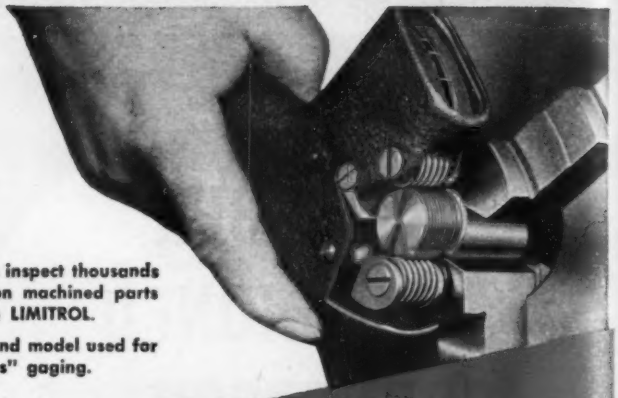
In Logan Lathes the smooth operation essential to finely finished precision work is doubly assured... first, by rubber cushioning at vital points... second, by carrying the countershaft on a three-point suspension. To absorb the motor's vibration, to prevent its transfer to the lathe proper, the patented Logan countershaft is rubber cushioned at all three of its main supporting points... the pedestal red and the two hinge pins. In addition, the cone pulley guard, which covers both countershaft and headstock, rests on rubber buttons. *The entire Logan countershaft assembly is so designed that at no point is there a direct metal-to-metal contact between countershaft and headstock.* Furthermore, the three-point suspension steadies the whole countershaft assembly so that it cannot rock. This combination of rubber cushioning and three-point suspension is another example of the advanced design that assures sustained accuracy, safe operation, long life, and high-speed, low-cost production in all models of Logan Lathes. Write today for your copy of the latest Logan Catalog.

LOGAN ENGINEERING CO.
CHICAGO 30, ILLINOIS

Logan

A NAME TO REMEMBER WHEN YOU THINK OF LATHES

*One of a series describing the finer features of Logan Lathes . . . Look for the next of the series



LEFT: Girls inspect thousands of precision machined parts daily with LIMITROL.

RIGHT: Hand model used for "in process" gaging.

6 Inspections in One

WITH LIMITROL

A NEW COMPARATOR GAGE BY WOODWORTH

VISUAL CHECKING OF:

1. Pitch Diameter
2. Lead
3. Taper
4. Out-of-roundness
5. Angle
6. Straightness

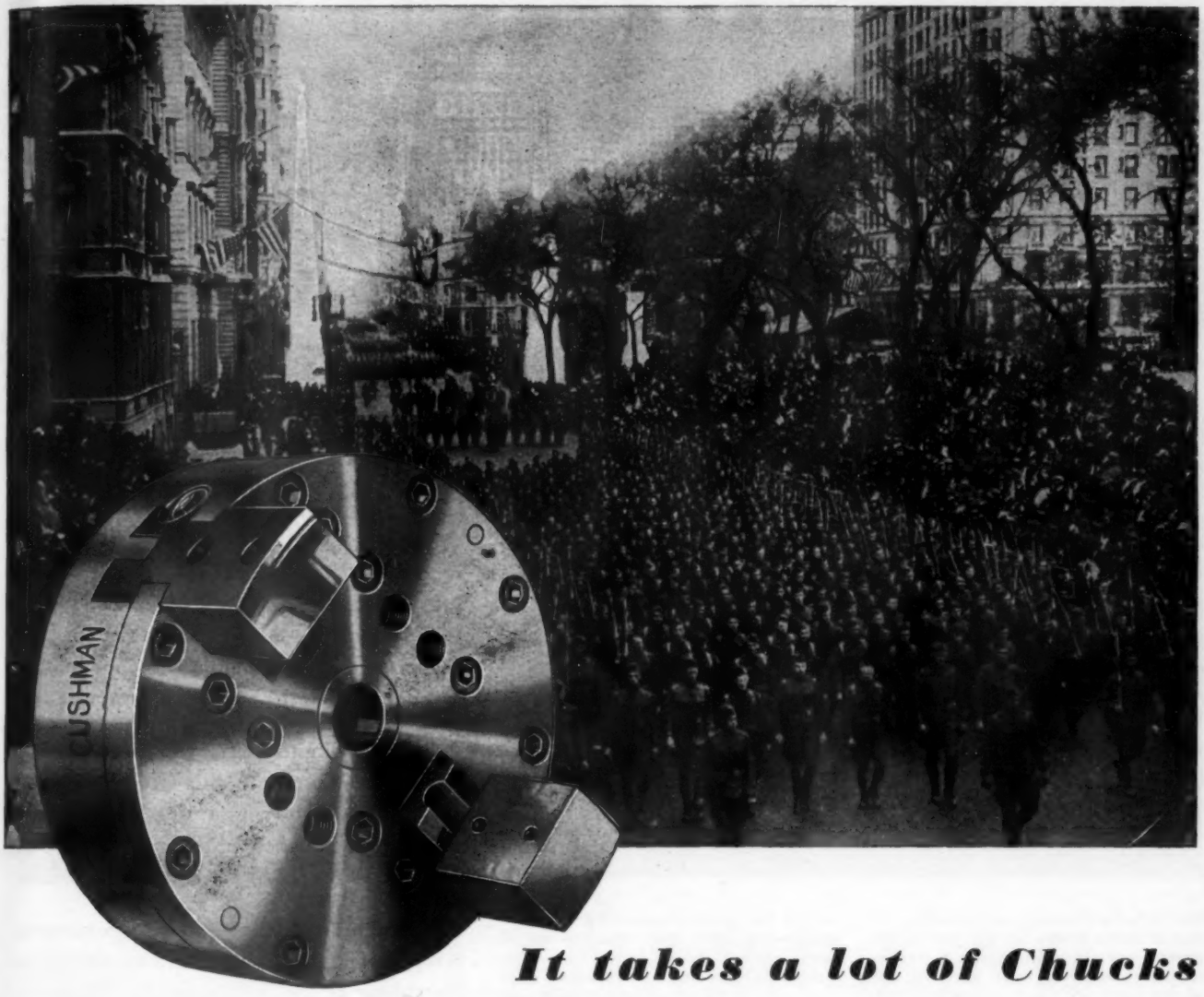
Write for Catalog 44-L

ACCURACY YOU CAN TRUST

WOODWORTH

N. A. WOODWORTH CO., SALES DIVISION, 1300 E. NINE MILE ROAD • DETROIT 20, MICHIGAN

PRECISION GAGES • GROUND THREAD TAPS • FORM TOOLS • PRECISION MACHINED PARTS • HEAT TREATING • PLATING



It takes a lot of Chucks to make a VICTORY . . .

There isn't a piece of mechanical equipment in the war today . . . in the air, on land, on the sea or under it . . . that has not required the services of chucks in its manufacture. As a result, chucks are among the most vital tools and the most needed weapons for the long, strong pull ahead of us. Therefore, we endorse and re-emphasize the Government's urgent call for Tool Conservation.

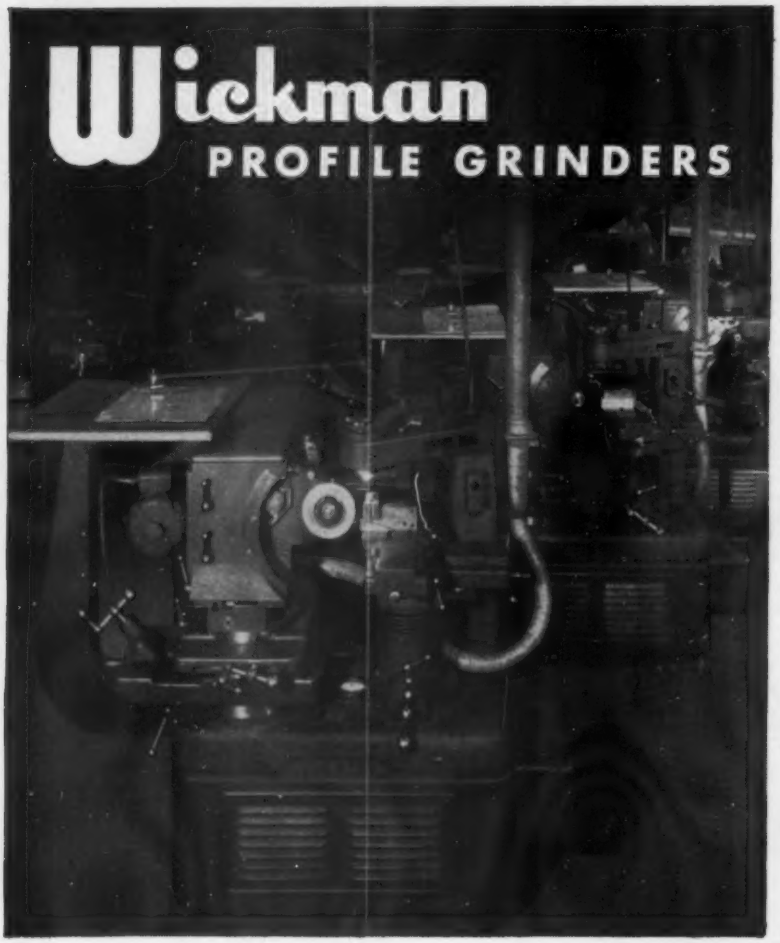
We know from long experience that most chuck failures are the result of: 1, Lack of lubrication; 2, Overloading; 3, Lack of cleaning.

There are six simple chuck maintenance rules that will save you time, money . . . and CHUCKS. They are printed on handy "Chuck Check" maintenance cards we supply free of charge for distribution to operators. Write for your supply. The Cushman Chuck Co., Hartford 1, Conn.

A WORLD STANDARD FOR PRECISION

ARM. E NAVY

CUSHMAN CHUCKS



MAKE POSSIBLE THE GRINDING OF FORM TOOLS By Relatively *Unskilled Men*

Present users of the Wickman Profile Grinder provide the evidence to prove that the machine effects definite savings in both machining time and in skilled manpower.

A man of limited skill can produce any desired contour with this profile grinder. An accuracy to within .0005" is easily obtained and reasonable care on the part of the operator makes closer limits possible.

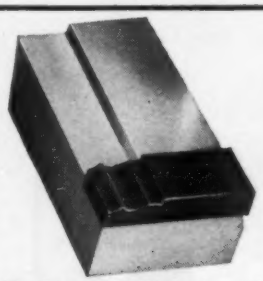
The Wickman Profile Grinder incorporates a fifty to one pantograph for controlling the formation of the profile, and a 30-power microscope for observing development of the profile and for accurate inspection of the work before it is removed from the machine. Write today for full information.

The Carboloy Company, who received the first Wickman Profile Grinder built in this country two years ago, now operate four of these machines, three of which are shown above. Here is what Carboloy says about these machines:

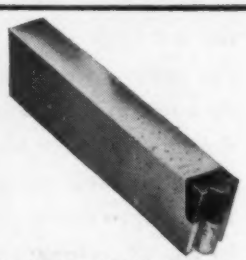
"It is difficult to quote an over-all average of time saved because the tools differ so widely but, generally speaking, the finish grinding on form tools suited to use of these machines can be done in about one-fourth the time that is required by other methods. The big advantage, in addition to the time saved, is that relatively unskilled help can do this work, and once a tool is ground to the projectograph template on this machine it is invariably correct."

TYPICAL CARBOLOY FORM TOOLS GROUND ON Wickman PROFILE GRINDERS

Circular form tool with preformed cemented carbide tips.
Stock removed ..... .015"
Grinding time including set-up .....Approx. 2 hrs.



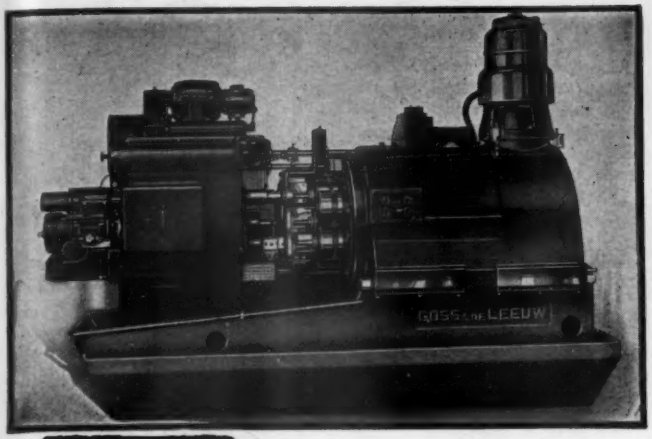
Flat form tool with preformed cemented carbide tip.
Stock removed ..... .015"
Width of tip .....1 35/64"
Depth of cut ..... ¾"
Grinding time including set-up (lots of 50) .....Approx. 1¾ hrs.

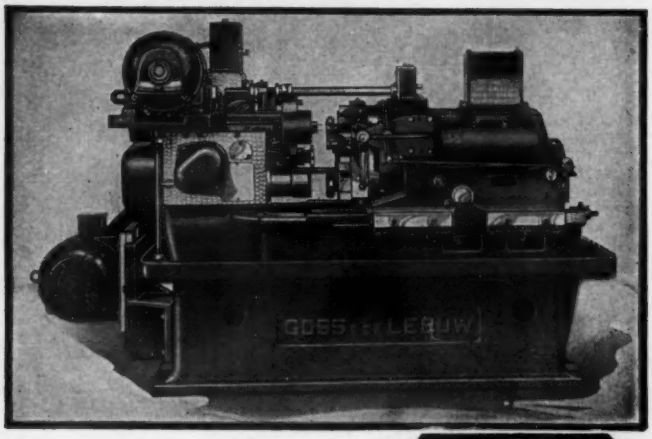


Flat form tool with preformed cemented carbide tip.
Stock removed ..... .015"
Width of tip .....51/64"
Depth of cut (Carbide only) ....25/64"
Full depth of cut.....55/64"
Grinding time including set-up .....Approx. 3 hrs.

THE Wickman CORPORATION
15539 WOODROW WILSON AVE.
DETROIT, MICHIGAN

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES





WORK ROTATING TYPE
5 Spindles
6 Spindles
8 Spindles

Features include:

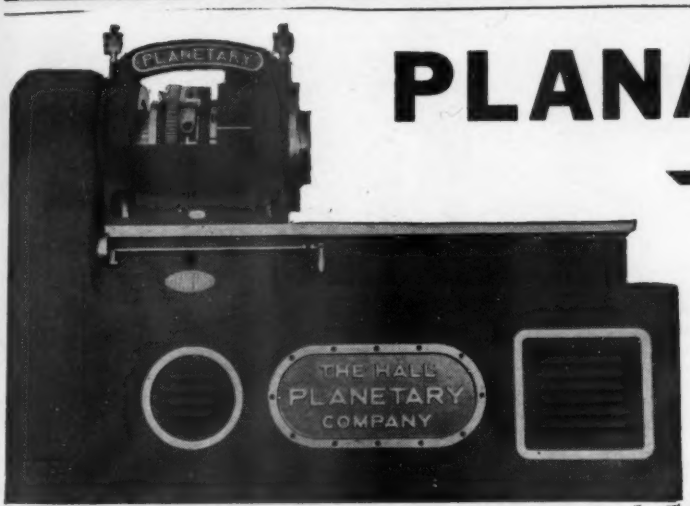
Lead Screw Threading on both types—Preloaded Anti Friction Spindle Bearings—Hardened Ways—Oversize Spindles—Gears of Chrome-nickel steel, carefully heat-treated.

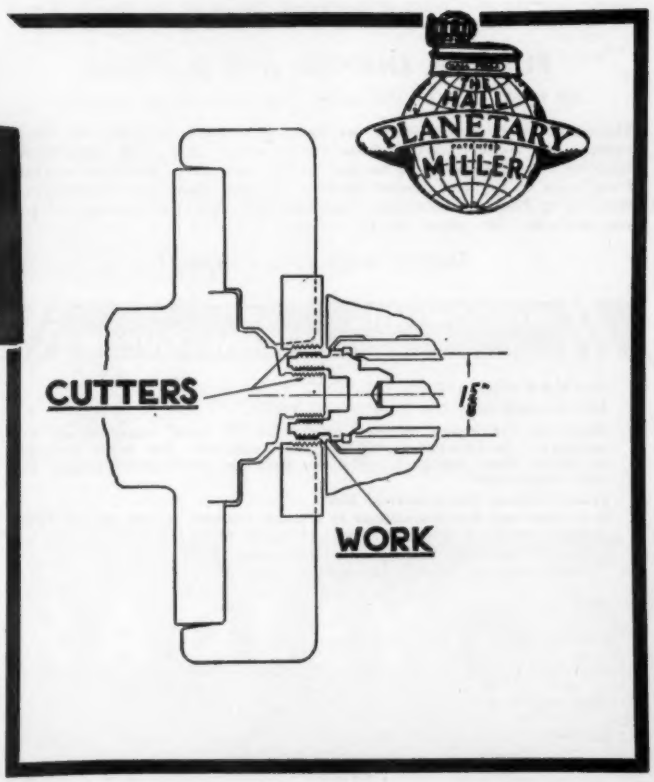
Write for copy of descriptive catalog giving complete, detailed specifications.

TOOL ROTATING TYPE
4 Spindles
5 Chucking Positions

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

PLANAMILLING





THREADS MILLED SIMULTANEOUSLY IN 45 SEC.

On the piece shown (a shell part), both threads are milled simultaneously in 45 seconds. Both of these threads are of different pitches and can be either right or left hand.

Simultaneous milling of both threads assures concentricity of both threads with each other and with the locating surfaces.

This normally difficult operation is easily handled on the **PLANETARY.**

Our engineers will gladly offer suggestions for speeding up your production

The
HALL PLANETARY COMPANY
Fox St. & Abbotsford Ave.
Philadelphia, Pa.

5 practical, authoritative McGRAW-HILL Books

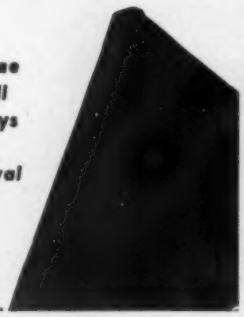
MARINE COPPERSMITHING

By FRANK J. CARR

Instructor of Coppersmithing, Puget Sound Navy Yard

Here is a book whose practical purpose is to show you step by step how to do that marine coppersmithing job. As useful for beginner as for more advanced coppersmith, the book covers the field from a simple description of tools and equipment to thoroughly illustrated directions for handling specific jobs. *189 pages, $2.00.*

See one or all 10 days on approval



DESIGN OF MACHINE MEMBERS

By ALEX VALLANCE

Chief Designer, Reed Roller Bit Co., and VENTON LEVY DOUGHTIE, *University of Texas*

These who wish a compact, sound treatment of machine design emphasizing the variations from theory required by practical applications will find this a helpful text and reference book. Special attention is given to engineering materials, factors of safety, utilization, and the selection of design stresses. *Second edition, 559 pages, $4.00.*

MATERIALS HANDBOOK

An Encyclopedia for Purchasing Agents, Engineers, Executives, and Foremen. By GEORGE S. BRADY, *Formerly Managing Editor, Product Engineering.*

6650 materials—metals, alloys, organic materials, industrial chemicals, paints and finishing materials, molding materials, minerals, woods, many processing materials used in the basic and intermediate industries, the chief raw materials of world commerce which are used in American industries, and many others—with information on chief characteristics, comparative data, sources, substitutes, adulterants, and uses. *Fifth edition, 765 pages, $5.00.*

TIMESTUDY FUNDAMENTALS FOR FOREMEN

By PHIL CARROLL, JR., *Management Consultant*

From this direct manual you will learn what improvements timestudy actually accomplishes; the step-by-step, simple procedure for making the study; exactly how the work-rating is determined; how to set new, improved working standards and get more and better production. *172 pages, $1.75.*

PLANING, SHAPING AND SLOTTING

By FRED H. COLVIN, *Editor Emeritus, American Machinist*

Shows the basic principles of the construction and operation of planers, shapers, and slotters, so that those who have had little or no experience in handling these machines may become familiar with them. Examples are taken from some of the best known machines of each class, and explanation of their parts, kinds of work done, recommended tools, work-holding methods, etc. is given. *125 pages, $1.25.*

Simply mail this coupon!

McGRAW-HILL ON-APPROVAL COUPON

McGRAW-HILL BOOK CO., INC.
330 W. 42nd St., New York 18, N. Y.

Send me the books checked below for 10 days' examination on approval. In 10 days I will pay for books plus few cents postage or return them postpaid. (Postage paid on orders accompanied by cash remittance.)

- ☐ Carr—Marine Coppersmithing, $2.00
- ☐ Vallance and Doughtie—Design of Machine Members, Second edition, $4.00
- ☐ Brady—Materials Handbook, Fifth edition, $5.00
- ☐ Carroll—Timestudy Fundamentals for Foremen, $1.75
- ☐ Colvin—Planing, Shaping and Slotting, $1.25

Name .....

Address .....

Position .....

City and State .....

Company ..... A. 2-2-44

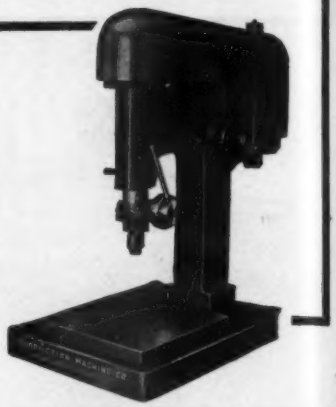
(Books sent on approval in U. S. and Canada only.)

The NEW REED BENCH DRILL TYPE 25 *Sensitive - Sturdy - with* INFINITE SPEED RANGE . . . . .

Rugged strength is provided in this simple, streamlined, highly sensitive and accurate machine. Only two castings comprise base and column. Because of its wide speed range—from 1500 to 10,000 R.P.M.—the Type 25 REED will handle a variety of light work.

Quality built throughout, with spindle mounted on finest precision ball bearings, this machine meets today's demands for sustained accuracy under long-hour service. Utmost safety is assured by total enclosure of all moving parts except drill chuck. Drive is by single belt from motor to spindle.

Made in 1, 2, 3 and 4 spindle models, with individual speed control and drive to each spindle.



CONDENSED SPECIFICATIONS

Capacity—¼"
Spindle Travel—3"
Adjustment of head—3"
Spindle to column—7"
Spindles—center to center—8"
Spindle speeds—1500 to 10,000 R.P.M.

Send for illustrated literature giving details.

PRODUCTION MACHINE CO.

Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.

GREENFIELD, MASS., U. S. A.

THERE'S AN EASIER AND BETTER WAY

Whiffing a fan thru the air every few seconds is no way to remove harmful dust and grit from buffers and grinders. The dirt drifts about, making it difficult for the worker to breathe. Sooner or later it settles into expensive machinery, clogs close-fitting parts. Eventually, it slows up production.

One sure way to remove harmful dirt completely—quickly—is with an Air Master. The Air Master catches dust and grit as it leaves the wheel—at the source. It is a sure protection for worker, work, and machinery. A size for every wheel. Easy to install. Easy to clean. *Write today for detailed literature.*

The Cincinnati

ELECTRIC DRILLS • GRINDERS • BUFFERS • PORTABLE TOOLS

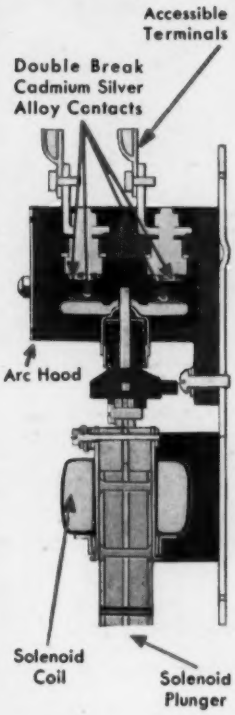
The Cincinnati Electrical Tool Co.

2676 MADISON RD.

Look how SIMPLE

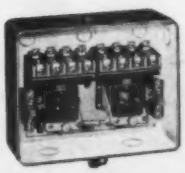
THERE'S ONLY ONE MOVING PART

Solenoid Plunger operates double break contacts with straight up-and-down motion.

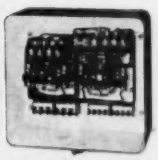


Arc hood enclosing the contacts provides unusually compact construction with plenty of wiring space at top, bottom, sides. A-B solenoid starters will interrupt at least ten times the maximum horsepower rating of the starter. Write for "The Story of the Solenoid Starter."

Automatic



Reversing



Multispeed

Combination

Allen-Bradley solenoid starters are trouble-free because they are so simple. The double break, silver alloy contacts require no maintenance. There are no pins, pivots, bearings, hinges, or flexible jumpers to gum up, stick, or corrode. They are good for millions of trouble-free operations. Send for Bulletin 709 today.

ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

QUALITY

Motor Starter Enclosures...
For Every Type of Service

You can find the correct type of enclosure in the Allen-Bradley starter line for any application.

The general-purpose enclosure, specified for most installations, is sheet steel . . . "bonderized" . . . to provide a rust-resisting undercoat for the baked enamel finish. The adhesion and durability of the enamel surface is tremendously increased. Infra-red lamp ovens are used for hardening the enamel top coat.

Enclosures for special applications are made of cast iron or sheet steel, depending upon the hazard encountered. Live rubber gaskets, machined fit between cover and base, wide machined flanges, or bolted covers provide full protection under various service conditions.

The two models for wall or pedestal mounting were designed specially for machine tool applications. They help improve the appearance of machine tools by making streamlining possible.

Contactors, relays, pilot controls, etc., are available in the same safe, practical, and carefully engineered enclosures.

ALLEN-BRADLEY COMPANY
1316 S. Second St.
Milwaukee 4, Wis.

ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

QUALITY

MORE · BETTER · FOR LESS!

WRITE FOR NEW ROLL FORMING BULLETIN

Many fabrication problems have been solved by the roll forming of strip metal.

STRENGTH IS ADDED TO PARTS
CHEAPER BASE METALS CAN BE USED
MACHINING IS REDUCED OR ELIMINATED

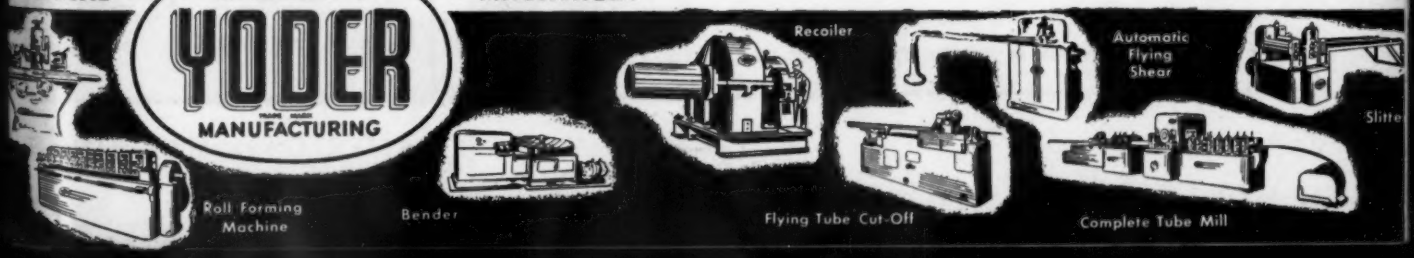
The Yoder Company has led in the engineering and manufacturing of a complete line of roll forming machines and auxiliary equipment, for over thirty years.

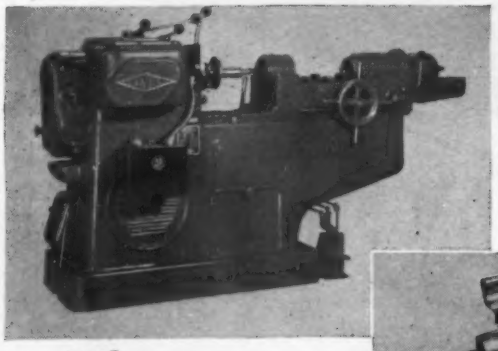
If you have a product and would like to know whether Yoder Roll Forming can be used to advantage . . . if you have a "hunch" on the making of a new product . . . if you are "stumped" . . . won't you write us? Send rough sketches, blueprints and notes. We'll be glad to make suggestions and present an estimate of cost.

THE YODER COMPANY • 5500 Walworth Ave., Cleveland 2, Ohio, U.S.A.

METAL • WORKING • PRODUCTION • MACHINERY

ENGINEERING
YODER
MANUFACTURING

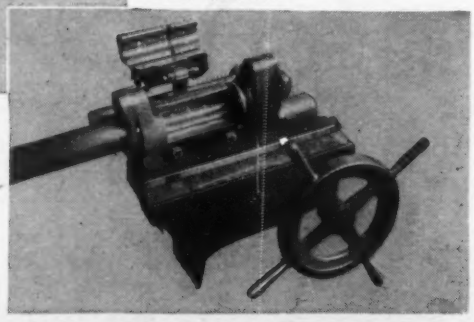




The Landmaco Threading Machine (at left), built by the Landis Machine Co., Waynesboro, Pa., is a good example of a leadscrew application of Ampco Metal.

• • •

These leadscrews (see below) are split, and the upper half is in two sections.



Where wear would mean play ... and costly loss of smoothness

... Landmaco Threading Machine is protected with leadscrew nuts of Ampco Metal

AMPCO Metal

Reg. U.S. Pat. Off.

The Metal without an Equal

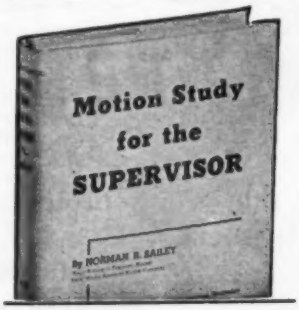
Leading machine-tool builders (almost 100 of them!) protect you against costly failures and breakdowns by using Ampco Metal parts at critical points—to resist wear, impact, fatigue, etc. This superior alloy of the aluminum bronze class lasts several times as long as ordinary bronzes — enabling you to avoid delays due to metal failure. Ask about Ampco Metal parts when you buy machinery. Also use Ampco to replace parts that fail. Write for bulletins.

M-4

Ampco Metal, Inc., Dept. AM-3, Milwaukee, Wis.

How to stop waste motion and speed up production

This book gives a simplified, practical method of motion study for analyzing operations quickly and easily, enabling the foreman to employ motion study as a useful, everyday tool in speeding production and increasing output in his department. It shows how to detect wasted effort in operations, how to recognize the cause of ineffective work, and how to develop better job methods.



MOTION STUDY for the SUPERVISOR

By Norman R. Bailey

Wage Standards Engineer, Kodak Park Works, Eastman Kodak Co.

Price only $1.25

Now the foreman or supervisor may use motion study as easily as any everyday management process. With only a stop-watch and a simple, basic "formula", he can analyze any operation for improvement. Even operations to which it formerly was unprofitable to apply motion study may be analyzed by the simplified methods explained in this book. Here is a practical means of eliminating ineffective work and of spotting opportunities for methods improvement, with worthwhile cumulative benefits in greater production per hour.

Shows you:

- —how to break down any operation into only 5 "work elements" common to all operations
- —how to time an operation
- —how to identify useful or wasted effort
- —how to reduce repetitive motions by simple changes in layout and planning
- —when to use simple fixtures for eliminating wasted effort
- —how to train the operator in new methods

EXAMINATION COUPON

McGraw-Hill Book Co., 330 W. 42nd St., N. Y. C.

Send me Bailey's Motion Study for the Supervisor, for 10 days' examination on approval. In 10 days I will send $1.25, plus few cents postage, or return book postpaid. (Postage paid on cash orders.)

Name .....

Address .....

City and State .....

Position .....

Company .....

F. A. 3-2 44

How to save time by doing more reading

That is a profitable paradox for you. More true today than perhaps ever before. For here in the pages of this publication are packed many helpful ideas . . . considerable useful information. Much of it, in fact, available from no other source.

And we most emphatically mean *both* the editorial and the advertising pages.

Just one new idea gleaned from these pages . . . a method for doing something better or faster or easier or at lower cost, may alone save you far more than a year's reading-hours invested in this and other worthwhile business papers.

Many people have found this a fact . . . not only once, but time and time again. That's significant . . . with time so precious today.

★

Good advertising speeds information from those who have it . . . to those who need it.

■

McGraw-Hill Publishing Company, Inc.

330 West 42nd Street New York

CONTINUOUS CUTTING MEANS TOP PRODUCTION

CAPACITY
8"x16" RECTANGULAR
8" DIAMETER, ROUND

The metal cut-off band saw principle, in use on all Wells saws, provides maximum production and economical operation through its continuous cutting action. This featured principle, CONTINUOUS CUTTING, is recognized by engineers as being the chief factor in efficient operation. EVERY TOOTH in the blade band does its SHARE OF CUTTING. No lost cutting contact.

The new Wells catalog will give you complete details on all Wells Metal Cutting Band Saw Products. Write for FREE Copy.

WELLS NO. 8

Wells SAWS
THE SIGN OF SERVICE

Wells

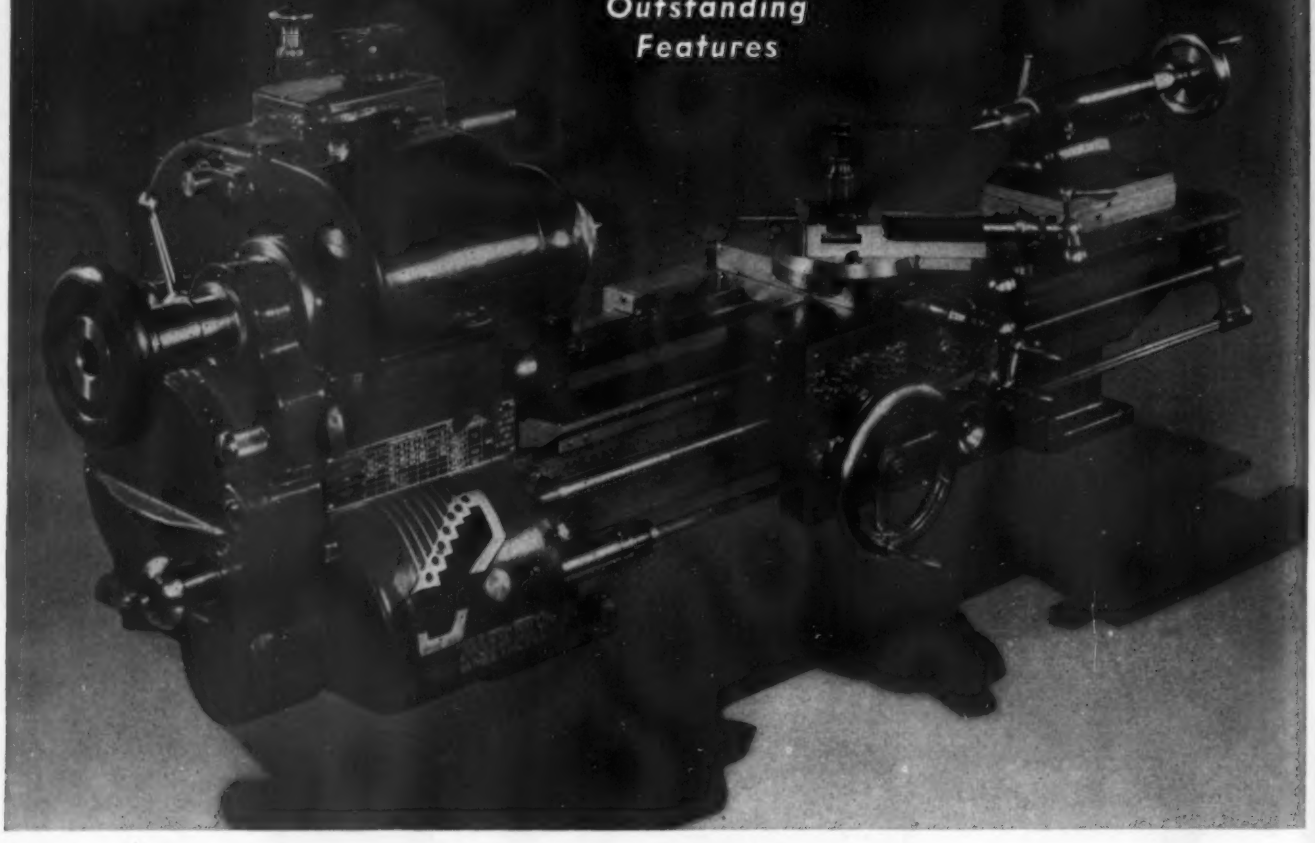
Products by Wells are Practical

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
505 ROOSEVELT ROAD, THREE RIVERS, MICH.

It Will Pay You To Check Up On This WADE TOOLMAKERS' PRECISION LATHE

It Has Many Outstanding Features



This No. 8-A Wade Toolmakers' Precision Lathe will meet your every requirement as to precision, versatility and stamina . . . for it is a carefully built lathe with many important features. The spindle has a 1" collet capacity, and is supported in a double row roller bearing, close to the nose. Thrust is taken on a precision ball bearing. The bed is 44", with 8½" swing. It is built on the correct principle of narrow guideways with broad wearing surfaces; it has lasting accuracy and the ability to take the heaviest cuts. The rugged tailstock spindle always has a bearing the full length of the barrel, has a scale graduated in 1/16ths, and a micrometer dial. It has a quick change gear box, and cuts threads as coarse as 6 TPI. Exceptionally close tolerances are possible. ***Write today for catalog***

Wade

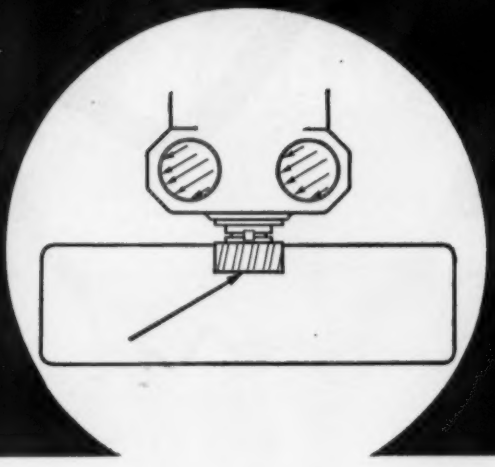
Bench Lathes and Profilers For Precision, Versatility And Stamina

THE WADE TOOL COMPANY

WALTHAM 54, MASSACHUSETTS

Balanced load

BETWEEN TWO POSTS...



Kent-Owens No. 1-14 Milling Machine with improved Hydraulic Control. Table 32"x9"; table travel 14".

Twin post mounting—*exclusive* on Kent-Owens Milling Machines—assures balanced load in either direction. This means no overhang and no cocking action. The head is mounted on two cylindrical ground steel posts which carry the spindle midway between them. The result is an unusually rigid and accurate machine which is practically chatter-proof for either direction of table travel. Send for latest bulletin. Kent-Owens Machine Co., Toledo, Ohio.

THERE'S A KENT-OWENS REPRESENTATIVE NEAR YOU

BOSTON
General Machinery Corp.

BUFFALO
Don W. Patterson

CHICAGO
Neff, Kohlbusch & Bissell

DALLAS
Hamilton-Huster Machinery Co.

DAYTON
Gosiger Machinery Co.

DETROIT
A. C. Haberkorn Machinery Co.

GRAND RAPIDS
Joseph Monahan

HOUSTON
Oliver H. Van Horn Co., Inc.

INDIANAPOLIS
Oatis-Booth Machinery Co.

KANSAS CITY
Eichman Machinery Co.

LOS ANGELES
Eccles & Davies Machinery Company
Harron, Rickard & McCone

MILWAUKEE
Neff, Kohlbusch & Bissell

MINNEAPOLIS
The Satterlee Company

MOLINE
John J. Normoyle Co.

MONTREAL
F. F. Barber Machinery Co.

NEW ORLEANS
Oliver H. Van Horn Co., Inc.

NEW YORK
Wilson Brown Company

PHILADELPHIA
Calco Machinery Company

PITTSBURGH
Barney Machinery Co.

ROCHESTER
F. W. Schiefer Machinery Company

SAN FRANCISCO
C. F. Bulotti Machinery Co.

SEATTLE
Star Machinery Company

ST. LOUIS
Blackman & Nuetzel Machinery Company
Clarke Equipment Co.

SYRACUSE
J. F. Owens Machinery Co.

TORONTO
F. F. Barber Machinery Co.

WALKERVILLE
F. F. Barber Machinery Co.

Call on KENT-OWENS for Milling Machines

new... ELECTRONIC

Confirms Ability of Insulation to Withstand Shorts Due to Voltage Surges

● Now, a new electronic test shows visually that the insulation of every coil, every turn and every phase of a G-E Tri-Clad motor winding has the strength to withstand the voltage surges that are a cause of shorts and grounds in service. Thanks to this new G-E development, no undisclosed insulation weakness can "get by."

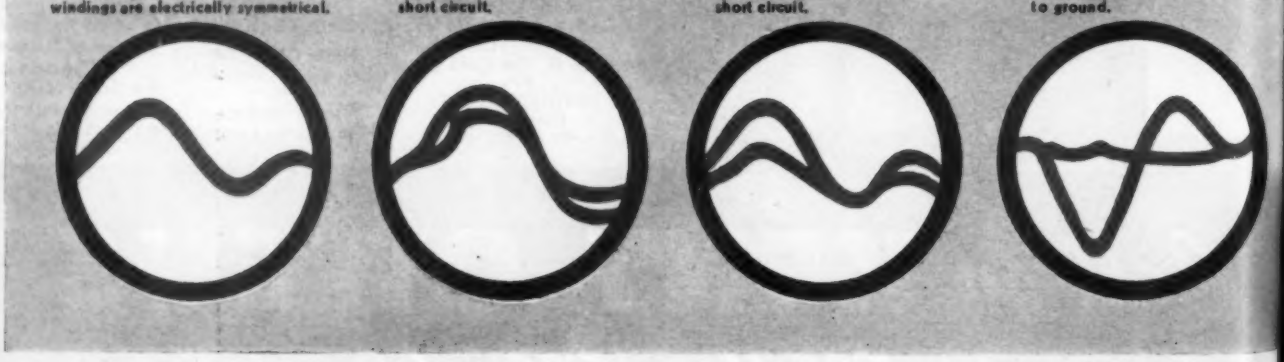
The new test method* subjects each coil in the assembled motor to a steep-front surge impulse, similar to a high-voltage transient of actual service. A cathode-ray oscilloscope indicates the performance of the winding under this sudden stress.

Only a motor with perfect insulation, and with the phases symmetrical, will give a single, clear-cut "standing wave" on the screen. The test indicates not only the condition of turn-to-turn insulation, but also that of coil-to-coil and coil-to-ground insulation.

This test is now applied to all G-E Tri-Clad motors, and to many other G-E motors and generators, as a regular step in production. Its advantages are so great that its use is widening throughout the motor industry.

*For complete details, see "Insulation Testing of Electric Windings," Trans. of A.I.E.E., Vol. 62, pp. 203-20

HERE'S HOW WINDING STRENGTH SHOWS UP ON THE OSCILLOSCOPE "WINDOW"


Oscilloscope "traces" coincide when two windings are electrically symmetrical.
Separation of traces shows a one-turn short circuit.
Further separation shows one-coil short circuit.
Result with one winding short-circuited to ground.

TEST Tells the "Inside Story" of Motor Windings

Production-line test of G-E Tri-Clad motors with new electronic tester. Operator turns transfer switch to take reading on each phase.

An Individual Check of Each TRI CLAD Motor Gives Extra Assurance of Unfailing Service

At each Tri-Clad motor factory, a production-line test setup like the one shown above is regularly in service. The motor windings are checked by this new test as an *additional* step in G.E.'s strict testing procedure. Other winding tests include the high-potential and high-frequency tests, in addition to many quality tests made on Formex* wire and other winding materials before they are used in the motor windings. Whenever you buy or specify a G-E Tri-Clad motor for your plant or machine, you get extra assurance of unfailing service. *General Electric Company, Schenectady, N. Y.*

*Reg. U. S. Pat. Office.

Every week 192,000 G-E employees buy more than a million dollars' worth of War Bonds.

GENERAL ELECTRIC

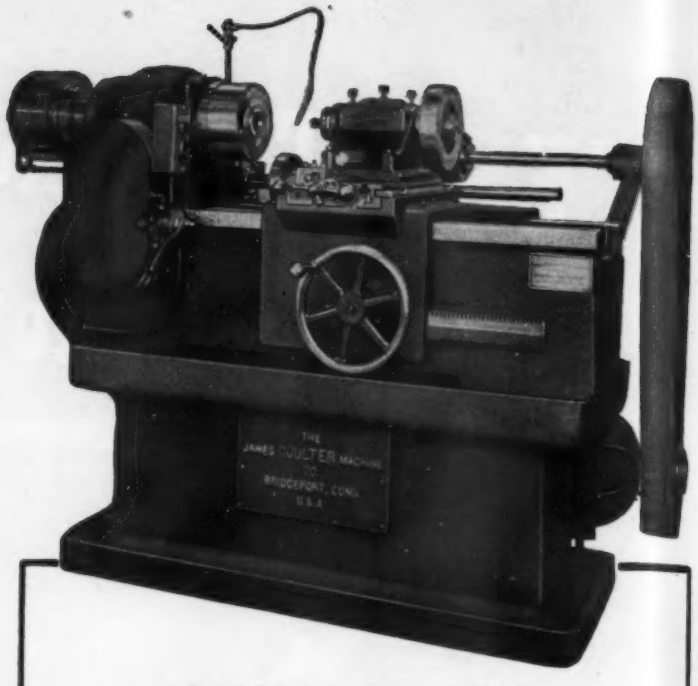
750-234-8030

Keep Ahead of
DEFENSE DEMANDS
on the PRODUCTION of
EXTERNAL and INTERNAL THREADS

The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.



Send for Descriptive Bulletin giving full information.

The James COULTER *Machine Co.*
BRIDGEPORT · CONNECTICUT · U.S.A.

Bridgeport

TURRET MILLING MACHINE
. . . the all-purpose machine with unparalleled range of utility

This machine will mill, drill, bore and shape at all conceivable angles. All angular settings in one plane are achieved by merely turning hand wheel controlling keyed overarm. It has always been furnished with the well known Bridgeport High Speed Milling Attachment which provides for drilling and boring at all angles without changing work setup.

Column, knee and table are of rugged construction. Wide ways and taper gib assure accurate, vibration-free operation. Entire machine is anti-friction bearing mounted.

NOW EQUIPPED WITH NEW SHAPING ATTACHMENT

This new attachment on back end of overarm is of sturdy construction and can be set at all angles. It provides for shaping such work as large and small dies and molds as well as for intricate production jobs involving slotting operations.

The "Bridgeport" Shaping Attachment is now available to every owner of Bridgeport Turret Milling Machines. Shaping and Milling Attachments can be mounted on all types of milling machines. They are in extensive use on special production equipment.

CONDENSED SPECIFICATIONS

Longitudinal Feed—20"
Cross Feed—9"
Vertical Feed of Knee—16"
Table—9" x 32"
Spindle Speeds—(Milling Unit) 275, 425, 700, 1050, 2100, 4250

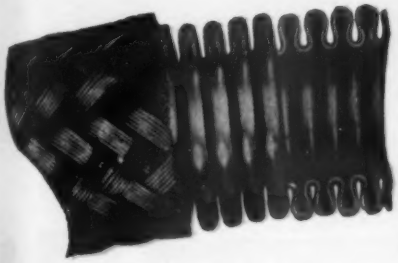
WRITE FOR ILLUSTRATED BULLETINS GIVING FULL DETAILS

THE BRIDGEPORT MACHINES, INC.
Bridgeport, Conn.

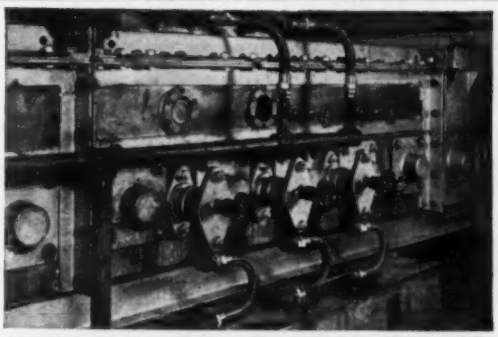
"Flexible as rope
STRONG AS PIPE
Essential in hundreds of services"

That might be one way to sum up American Metal Hose... the all metal conductor that conveys gases, oil, steam, water, air, solvents, chips and dust under the widest range of temperatures, pressures and exposures to be encountered in industry... the flexible tubing that isolates vibration, connects misaligned parts, loads and discharges cargoes... provides rigid pipe security in connecting moving machine parts with gas, oil, air, water, or steam supply.

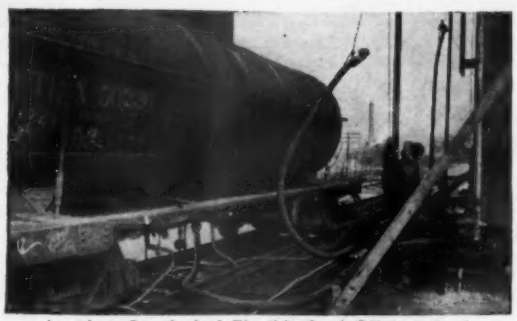
AMERICAN SEAMLESS



American Seamless. For applications where 100% tightness is essential. Made from *seamless* metal tubes—no packing, joints, welds or laps—the best "insurance" against leakage. Ideal for conveying air, oil, steam, water, volatile liquids and gases. Wire braid "jackets" reinforce tubing for high pressure services. Available in any workable metal.



American Seamless Flexible Bronze Tubing insures tight, free-flowing water connections to safeguard the accurate, continuous performance of this shell-case annealing furnace.



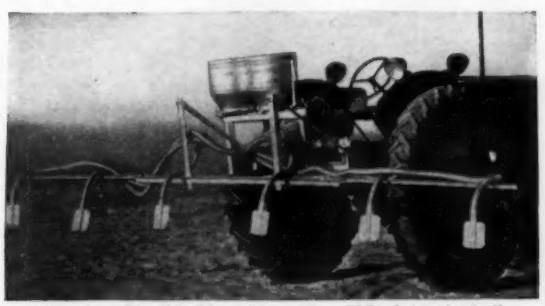
American Interlocked Flexible Steel Oil hose loads and discharges tank cars, may be used on practically any cargo that will flow through a pipe.

AMERICAN INTERLOCKED

American Interlocked. Strip metal, wound into "full-interlock", packed with asbestos, forms the toughest flexible hose for all-round service... the strength and last-ability of metal plus extreme flexibility for ease in handling. Made in bronze for steam and water—galvanized steel for oils...also in other workable metals.

AMERICAN TYPE U.I.

American Type U.I. Full interlocked, but unpacked...a lightweight flexible metal hose for carrying hot air, grinder dust, chips or light dry material. Made from brass, galvanized, stainless steel, aluminum, in sizes to 8" I.D. 44193



American Flexible Metal Hose, Type U.I., fights the boll weevil in conveying chemical powder to the spray heads on this Cotton Dusting Machine.

ANACONDA

American Metal Hose

AMERICAN METAL HOSE BRANCH OF THE AMERICAN BRASS COMPANY • General Offices: Waterbury 88, Conn.
Subsidiary of Anaconda Copper Mining Company • In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ontario*

Positive action of BARRETT TYPHOON CENTRIFUGAL WASHERS provides for quick, thorough parts cleansing

In these efficient centrifugal machines the washing solution enters the top of the whirling load under valve control. The operating principle—being that of a typhoon—gives the washing solution a spraying, swirling, and surging action which thoroughly permeates the contents. During this action, centrifugal force creates hydrostatic pressure within the basket. That proportion of the deluge going to the bottom is forced up the side and out carrying off the contaminated fluid.

A thorough, quick cleaning is definitely assured by flowing sequence. Two or more liquids may follow, making it possible to wash, rinse or provide any further treatment as required.

Several Barrett installations involve the use of four machines operated by one man who loads and unloads in three minute cycles. Washing time is only one minute. Another type of set-up provides for recovering oil, washing, drying, and coating with rust-proofing material.

As in all Barrett Centrifugal machines, provision is made for convenience and safety of operation.

Send at once for details of Barrett Typhoon Washer

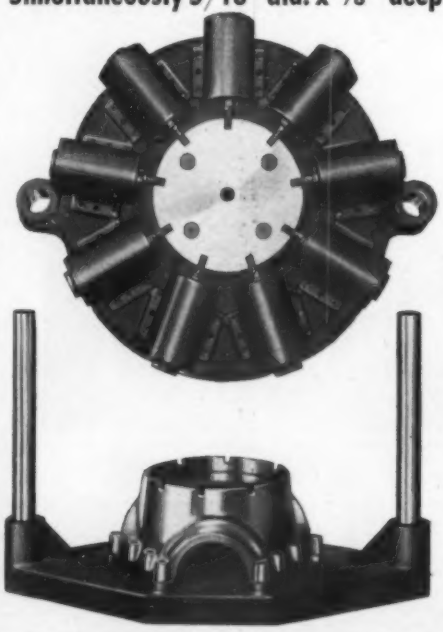
Barrett Centrifugal Washer — made in capacities from 13 to 38 cu. ft. per hour. Each size, depending on condition, will perform at the rate of 20 duty cycles per hour.

THE LEON J. BARRETT CO., WORCESTER, MASS.

Designers and Builders of Centrifugal Machinery

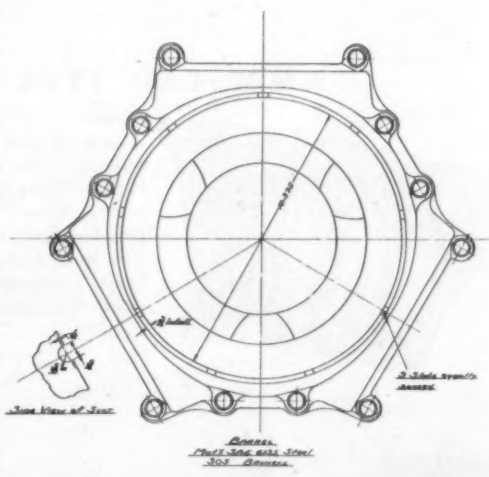
End Milling 9 Adjusting Nut Locking Slots on a Propeller Hub...

Simultaneously 5/16" dia. x 3/8" deep



The 9 Spindle Head (looking up at the bottom) mounts on a standard Heavy Duty Driller and travels upon the guide bars shown as a part of the fixture. The work—a propeller hub—is mounted on this fixture and located by two dowel holes. Due to the method of operation of the plate in the center of the head (sliding on four short guide posts and backed up by four springs) there is no necessity of clamping the hub since this hold-down plate clamps the work until after the operation on the hub has been completed and the head returned to its original position.

The 9 horizontal spindles carrying the 9 end mills in a horizontal plane are driven through helical bevels (hardened) from a 9 Spindle Regular Multiple Head — the horizontal spindle housings however being an integral part of the regular 9 Spindle Head.



●

The old method for making locking slots was by means of a hand miller end milling one slot a time and then indexing the hub nine times.

The tremendous saving, using Hoefer Heads, is very apparent. Maybe you have an unusual job to which our engineers can apply a Multiple Head, bringing about large savings.

Send in the blue prints and tell us your problems.

Hoefer's Whole Business is Holes . . . . **HOEFER MFG. CO.** *Freeport, Ill.*

HOW 3 SUNDSTRAND SPECIAL PROCESS MILLING MACHINES

1 *replaced 18 special milling machines*

2 *saved $249,984.00 per year...in addition to increasing tool life*

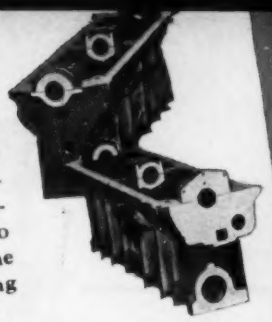
3 *automatically mills 16 surfaces each machine cycle*

4 *produced 8,750,000 cylinder blocks in 7 years*

5 *eliminated "operator's fatigue" for 18 men*

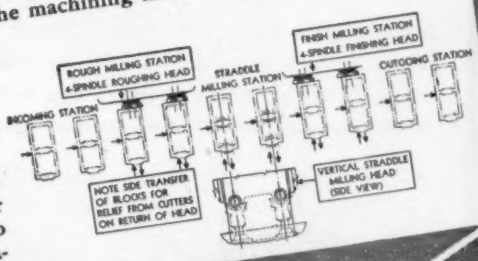
The Problem...

consists of rough and finish milling the front end and straddle milling the rear and intermediate bearing faces. The equipment used previously occupied considerable floor space and was so designed that the cylinder blocks had to be lifted from a conveyor line to the machine, a tedious and extremely tiring operation.



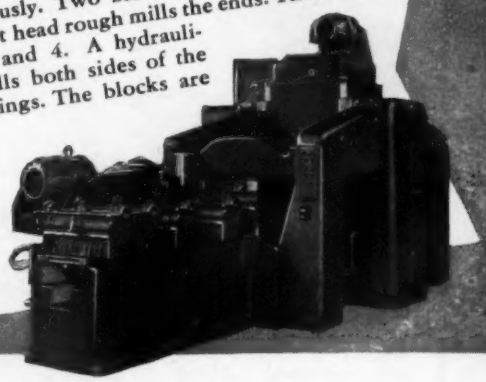
The Solution...

Sundstrand Engineers designed this machine to incorporate all of the operations in each of the 3 machines. This makes it possible for the operator to control the machining from a push button station. The sketch illustrates the sequence of operations and flow of blocks through the machines. Note the ingenious method of incorporating vertical milling together with the transfer sidewise, so cutters do not return over machined surfaces.


ROUGH MILLING STATION
4-SPINDLE ROUGHING HEAD
FINISH MILLING STATION
4-SPINDLE FINISHING HEAD
INCOMING STATION
STRADDLE MILLING STATION
OUTGOING STATION
NOTE SIDE TRANSFER OF BLOCKS FOR RELIEF FROM CUTTERS ON RETURN OF HEAD
VERTICAL STRADDLE MILLING HEAD (SIDE VIEW)

The Machine...

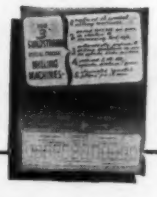
mills six blocks simultaneously. Two blocks automatically move into stations 1 and 2. The left head rough mills the ends. The blocks then move into stations 3 and 4. A hydraulically fed head straddle mills both sides of the intermediate and end bearings. The blocks are shuttled into stations 5 and 6. The right head finish mills the ends. The blocks are unclamped, clamped and moved automatically between each operation.



● Designed and built in 1936 these special process milling machines have established an outstanding performance record. Prior to their installation, 12 conventional special high production rotary face milling machines and 6 special vertical straddle milling machines were used. Three Sundstrand special process Rigidmils do the same amount of work at a saving of 15 machines. In addition to these savings, there is a considerable amount saved in electrical power, floor space and maintenance. Also, the previous trouble of getting the bearing faces square with the front end face of the cylinder block has been entirely eliminated.

FREE ADDITIONAL DATA . . .

is included in this folder. Additional features are stressed. For instance, 3,500 cylinder cases per grind with a 25" feed per minute, taking a ⅜" depth of stock is another accomplishment of this machine. Write for this information today. It may prove valuable information in planning present or postwar production. Ask for Bulletin No. 122.



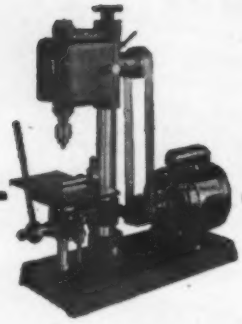
SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS, U.S.A.

ARMY (E) NAVY

SUNDSTRAND MACHINE TOOL CO.

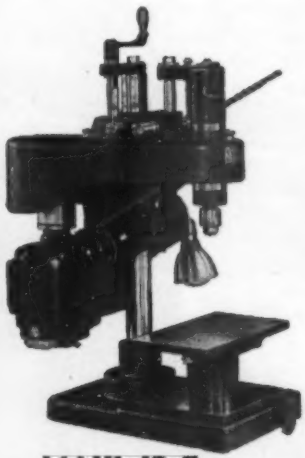
Rigidmils • Fluid-Screw Rigidmils • Automatic Lathes • Hydraulic Equipment • Drilling and Centering Machines • Special Milling and Turning Machines

2533 ELEVENTH ST., ROCKFORD, ILLINOIS, U. S. A.



HAMILTON MUEHLMATT SENSITIVE TAPPER

A high production sturdy little machine particularly suited to precision tapping of light work—instruments, cameras, watches, clocks and the like. Easy to operate—can be attached to any light socket.

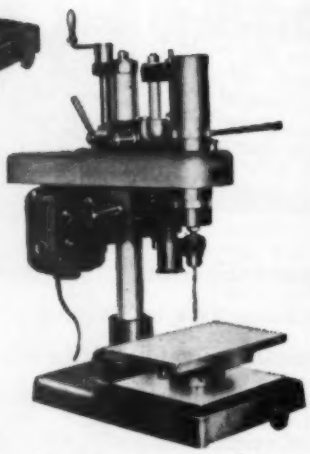


"VARIMATIC"

Built with instrument precision allows instantaneous variable speed adjustment in two ranges. Low range 840 — 270 R.P.M. High range 2900—9300 R.P.M. Drill capacity .004" to 5/16".

MAXI-JR-E

Designed and built for accurately drilling small holes .004" to .250" diameter. It consists of a self contained drilling unit which swings radially on the column and may be locked in any desired position. This extremely flexible small drilling machine may be ganged for sequence operations or to increase production. Spindle speeds from 750 to 21,000 R.P.M.



The "Varimatic" and the Maxi-Jr.-E each feature a full floating spindle of special design which eliminates radial belt pull on the spindle.

•

Write for full particulars on any or all of the machines shown.

The Hamilton Tool Co.

830 NINTH ST. HAMILTON, OHIO

BURKE MILLING MACHINES

. . . Put Your Small Work on a Production Basis!

Those small, difficult jobs can be handled on a *production basis* with BURKE Motor Driven Milling Machines Nos. 1, 2, 3, & 4. Primarily, this is because BURKES have been *specially designed and built* to do smaller milling jobs efficiently and economically.

Then, too, a number of attachments are available . . . attachments that increase the units usability, and add to your productivity. These include a vertical milling attachment, index centers, and vises—3 types, including swivel base. Now, when production must be stepped up, is the time to investigate the profit possibilities of BURKE Milling Machines, as applied to your work.

Complete Information Will Be Sent You Upon Request—Write!

BURKE MACHINE TOOL CO.

CONNEAUT • • • OHIO

KEYSEATING

The Modern Way

Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1¼" in width.

Great simplicity and ease of operation of Davis Keyseaters assure the user of accurate, time saving work.

Let our engineer study your keyseating problems.

DAVIS KEYSEATER COMPANY

403 EXCHANGE ST. ROCHESTER, N. Y.

KEEP 'EM FIRING • BUY WAR BONDS

Atlas MULTIPLE SPINDLE DRILL PRESSES

CONDENSED SPECIFICATIONS	
Maximum Distance, table to chucks	26"
Columns to Center of Spindles	7½"
Spindle Travel	4"
Overall	58" x 31¼" x 79½" high
Net Weight less motors	1040 lb.

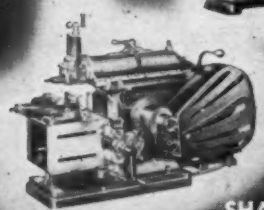
Atlas 4 TOOL TEAM FOR SMALL-PARTS MACHINING

1 LATHES

2 MILLING MACHINES

3 DRILL PRESSES

4 SHAPERS



Precision STOPS THE TIGER TANKS!

The Nazis counted heavily on their ponderous Tiger tanks but tank destroyers stopped them cold. Again the vision of our Army and civilian designing engineers — plus the ability of American industry to get into precision production in a hurry scored another decisive ordnance victory!

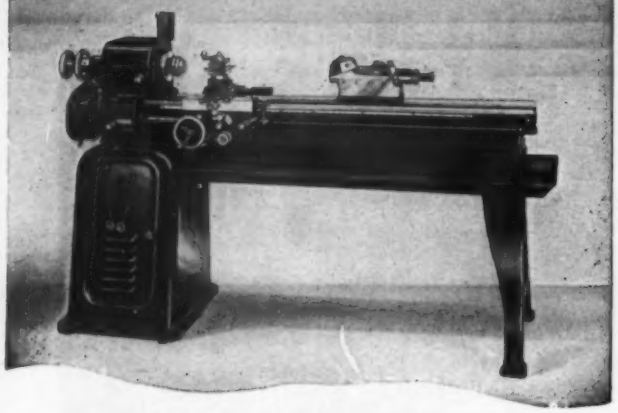
Atlas machine tools contribute importantly to this precision in thousands of war plants . . . and help to maintain it in the mobile machine shops of our armed forces. The Multiple Spindle Drill Press, for example, has drilled and tapped literally billions of holes for Victory. It's a favorite for stamina, accuracy, and speed on series drilling and tapping operations. Its low cost and high production capacity have cut costs for hundreds of plants.

Atlas precision and low cost can help you win peacetime business, just as it is helping win wartime battles. Keep Atlas in mind for re-conversion . . . send for Atlas catalogs now for quick reference when you need tools.

ATLAS PRESS COMPANY

304 N. PITCHER STREET • KALAMAZOO 13D, MICHIGAN

SHELDON



PRECISION TOOL ROOM AND PRODUCTION LATHES

Best known as quality tool room lathes, SHELDON Precision Lathes are also ideally suited for much second operation and other production work because of their extra collet capacity, sturdy construction, accuracy and available production features including: Lever operated Bed Turret, or Tool Post Turrets, Lever operated Collet Attachments, Tailstocks, Double Tool Posts, 4-speed underneath motor drives, etc. If you are looking for a 10", 11" or 12" Precision Lathe for the Tool Room or Production Line, be sure to see the SHELDON Lathe before you order.

SHELDON MACHINE COMPANY, INC.

4234 N. Knox Ave. CHICAGO 41, U.S.A.

NOBLEWEST AUTOMATIC

Numbering Heads

FAST • ACCURATE • DEPENDABLE

Unsurpassed in quality, Noblewest Automatic Numbering Heads can be relied upon to number consecutively with automatic precision. Numbers may be kept constant if desired. Can be used on flat and round surfaces. Choice of number styles and sizes. Write today for details.

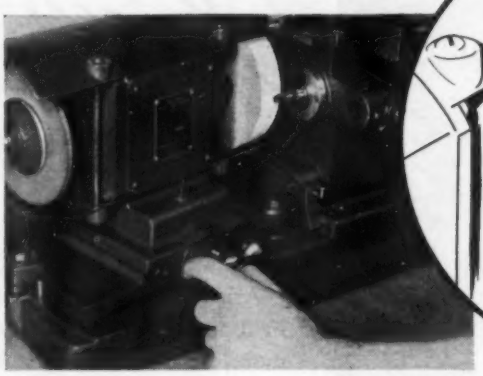
NOBLE & WESTBROOK MANUFACTURING CO.

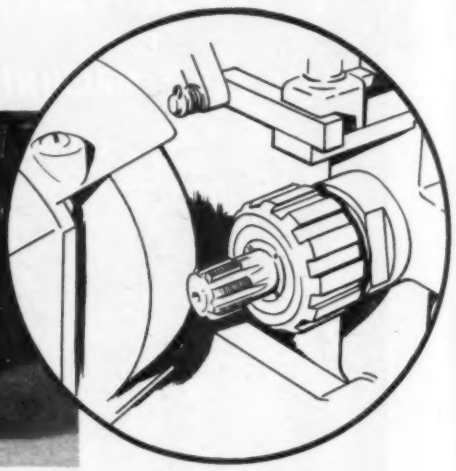
Marking Specialists Since 1904

EAST HARTFORD, CONNECTICUT

MARK IT BEST WITH NOBLEWEST® NOBLEWEST IMPROVED MARKING DEVICES

THE BLAKE TAP GRINDER "PAID FOR ITSELF *10 times over*"—





Another of the country's leading manufacturers recently bought a Blake Tap Grinder. It has been running continuously — three shifts a day — sharpening the chamfer on stud bolt taps. "This unit has already paid for itself ten times over," is typical of the comments regarding Blake Tap Grinders. But you get other advantages, too — tremendously increased tap life — less work spoilage — fewer broken taps — less tap inventory.

The Blake is built in two models for taps No. 0 to 2" and up to 14" long. Either model will sharpen taps with 2, 3, 4, 5, 6, 8 or 10 flutes, right- or left-hand, without extra equipment.

Please send me your new folder giving complete details on No. 1 and No. 2 Blake Tap Grinders.

NAME..... TITLE.....

COMPANY .....

STREET .....

CITY..... STATE.....

A.M.

EDWARD BLAKE COMPANY

634 COMMONWEALTH AVE., NEWTON CENTRE 59, MASS.

BLAKE TAP GRINDERS—L & D HIGH SPEED DRILL PRESSES—WALTHAM CUTTER SHARPENERS—AMERICAN TOOL HOLDERS—BLACK DIAMOND PRECISION DRILL GRINDERS—FILTAIRE PORTABLE DUST COLLECTORS

DEPENDABLE...

... so are MORSE TOOLS

That's why time out for replacing and resharpening is reduced when you use Morse Tools.

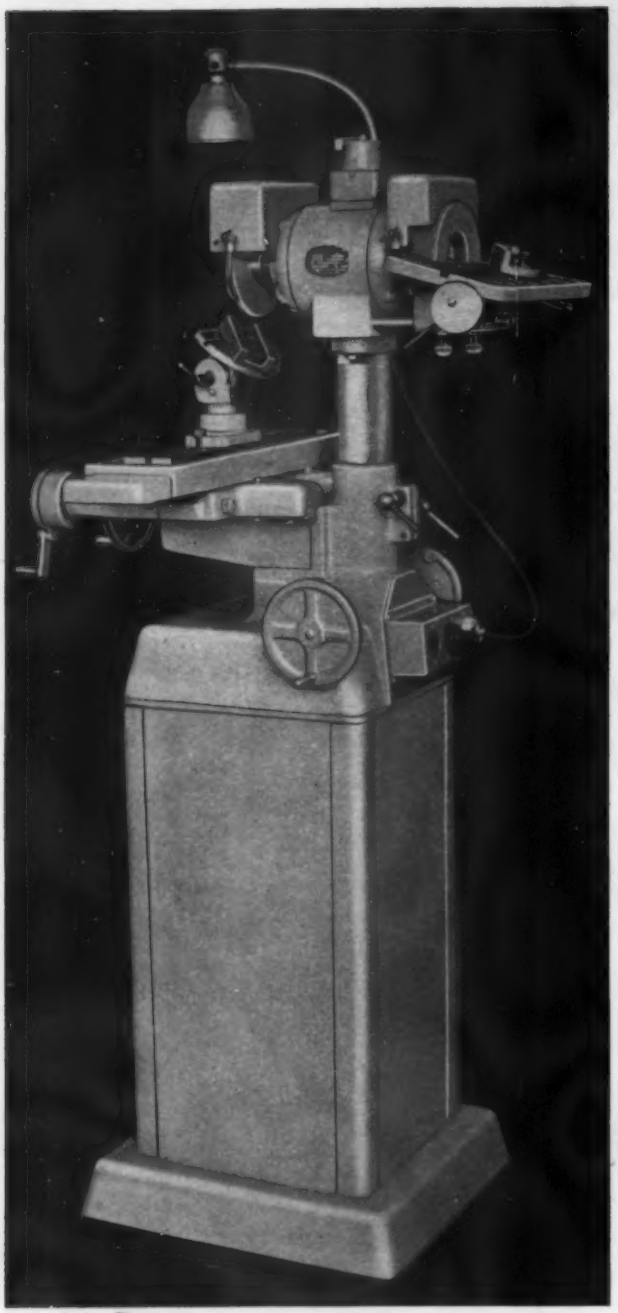
TOOLS ARE WEAPONS--- TREAT 'EM RIGHT!

MORSE THERE *IS* A DIFFERENCE

TWIST DRILL AND MACHINE COMPANY

NEW BEDFORD, MASS., U. S. A.

NEW YORK STORE: 130 LAFAYETTE ST. - - - - CHICAGO STORE: 570 WEST RANDOLPH ST.



The UNIVERSAL Carbide TOOL GRINDER

KNOCK-OUT

Write for Bulletin CTG.-43-A. M.

K. O. LEE COMPANY
ABERDEEN SOUTH DAKOTA

PORTAGE

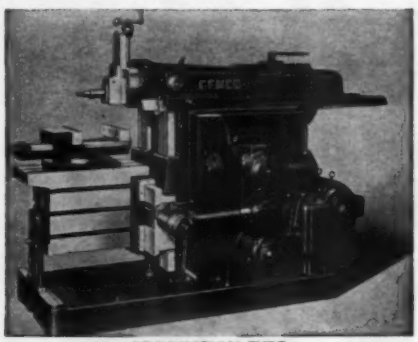
HORIZONTAL BORING, DRILLING AND MILLING MACHINE NO. 4

• Featuring an extended saddle and table with outer rail support for maintaining exceptional accuracy on long work. Get fully acquainted with the many features of this modern Boring Mill. *Ask for a copy* of our new instructive bulletin which points out the numerous advantages of this new Horizontal Boring, Drilling & Milling Machine.

THE PORTAGE MACHINE CO.
AKRON 11, OHIO

Matched for the Job!

GEMCO *Multi-Purpose* **SHAPERS**



PRODUCTION TYPE

PLAIN TYPE A fast utility machine for a wide variety of the average shop work and for training purposes in industrial schools.

PRODUCTION TYPE Massively constructed with a large table to handle medium heavy work on a peak production basis with high limits of accuracy.

UNIVERSAL TYPE Ideal for tool and die work, experimental laboratories and model shops or where angular work set-ups are required.

Write for illustrated bulletin GC-12A.

Immediate Deliveries on Firm Orders!

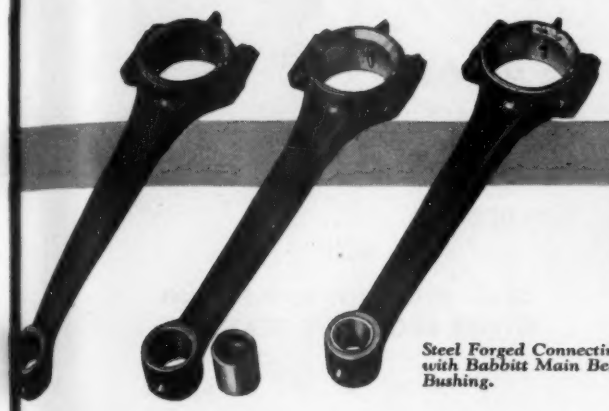
GENERAL ENGINEERING & MFG. CO.
ST. LOUIS 4, MISSOURI

Manufacturers of Precision Equipment SINCE 1917

Accuracy of ±.0001" with *Extremely High Finish*

Maintained in Precision Boring Connecting Rod Bearings on a

STOKERUNIT SIMPLEX *Precision* BORING MACHINE



Steel Forged Connecting Rod for Gasoline Engine with Babbitt Main Bearing and Bronze Wrist Pin Bushing.

ACTUAL BORING TIME EACH 32 SECONDS COMPLETE

In the plant of this gasoline engine manufacturer, both wrist pin and main bearings in connecting rods are bored simultaneously on a No. 2U Stokerunit Simplex Two-Way Four-Spindle Precision Boring Machine. The two double-spindle ends of the machine alternate in the roughing and finishing operations.

Here is the interesting operating cycle in this installation as handled by two operators:

FIRST SPINDLE—Rough boring babbitt bearing; stock removal 1/32". Also facing and chamfering one side of bearing.

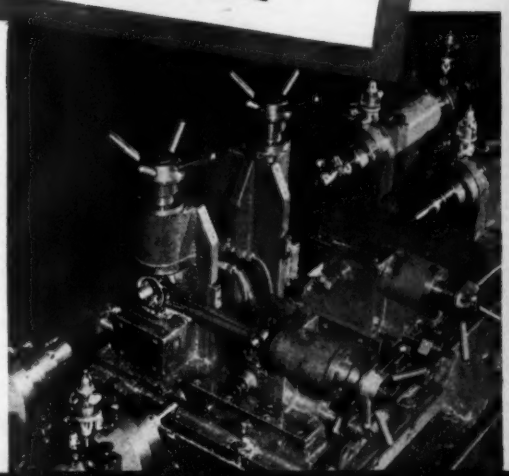
SECOND SPINDLE—Finish boring wrist pin end of rod in steel forging (230 Brinell); stock removal .010". Bore is .875" dia. by 1" long.

At this point, one operator removes the rod and presses in the bronze wrist pin bushing, while the other operator loads the machine for the initial operations.

THIRD SPINDLE—Finish boring babbitt bearing; stock removal .005". Bore is 1.752" dia. by 1 1/8" long. Also facing and chamfering other side of bearing.

FOURTH SPINDLE—Finish boring bronze bushing on wrist pin end of rod; stock removal .004". Bore is .750" dia. by 1" long.

One operator now removes this completed rod and loads other end of machine for the final operations.



Special 3-Center Holding Fixtures for each end of the machine. The two ends alternate in the boring cycle, each end boring wrist pin and main bearing simultaneously.

Two operators maintain production of 70 connecting rods per hour. Actual boring time of each piece is 32 seconds complete.

PRECISION ACCURACY WITH SUPERIOR FINISH MAINTAINED IN PRODUCTION

Tolerances of ± .0001" *and better* are consistently held in production with diamond tools for the babbitt bearing and bronze bushing. An extremely high finish is produced. Tungsten carbide tools are used for boring the steel forging.

Actual boring time is a total of 32 seconds per connecting rod in all boring operations of wrist pin and main bearing bores. Spindle speed is 2600 r.p.m.; feed .002" per revolution. Total floor-to-floor time is 70 pieces per hour.

PROFIT WITH STOKERUNIT VERSATILITY

Stokerunit Simplex Unit-Type Precision Boring Machines are adaptable to innumerable precision boring operations. Over 25 models are available in both mechanical and hydraulic feeds, with single or multiple spindles, for either short-run or production work. Among them you will find the model which will solve *your* precision boring problems.

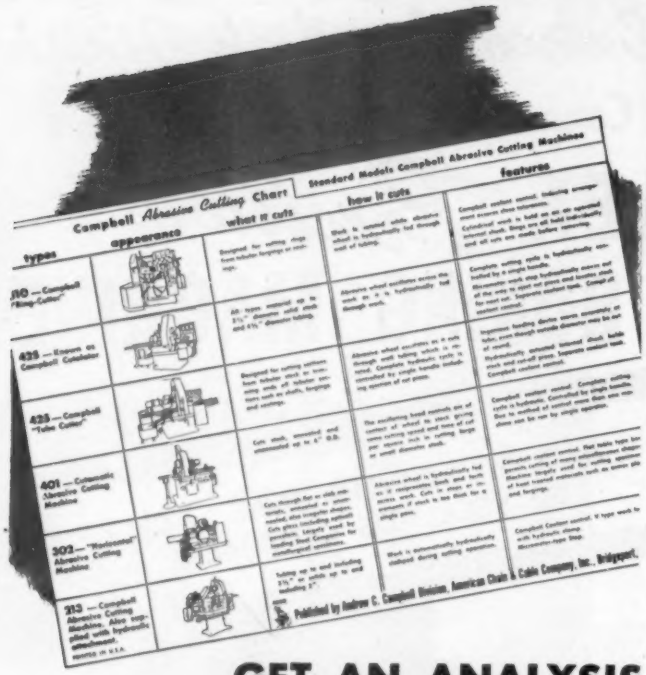
Write for complete details now. Send blueprints of parts with production requirements for specific recommendations. No obligation.

WRITE TODAY for these two booklets covering our entire line of Simplex Precision Boring Machines. Full details and specifications of each type are included.

STOKERUNIT CORPORATION

DESIGNERS AND BUILDERS OF PRECISION BORING MACHINES AND MILLING MACHINES

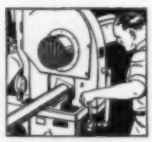
4524 WEST MITCHELL STREET · MILWAUKEE, WISCONSIN


Campbell Abrasive Cutting Chart
Standard Models Campbell Abrasive Cutting Machines
types
appearance
what it cuts
how it cuts
features
Published by Andrew C. Campbell Division, American Chain & Cable Company, Inc., Bridgeport

GET AN ANALYSIS OF YOUR CUTTING JOBS

—*without obligation*

Based on the actual production records of the CAMPBELL complete range—the only complete range—of Abrasive Cutting Machines, Campbell engineers will gladly work up cost sheets and production procedures for your cutting. • All you need do is state the materials, shapes and sizes you are cutting, lengths before cutting, lengths of cut-off pieces and production required per hour. • The schedules given you will be practical and attainable. They will be based on the performance of some one of the 8 types and 19 models of CAMPBELL Abrasive Cutting Machines that are currently cutting all grades of steel, annealed and unannealed, non-ferrous alloys, plastics, glass and ceramics—solid bars, tubular and flat stock. • Ask for a copy of the chart shown above, too. It will give you fundamental information on the possibilities of abrasive cutting.



Campbell Cutamatic No. 401
Oscillating and Rotating Wheel. Cuts steel up to 6".

Campbell No. 302
Odd shapes, Flat Stock, Slotting Flat Stock, etc.

Campbell No. 213
Cuts Tubing up to and including 3½". Solids to 2".

Campbell Cutalater No. 425
Cuts Tubing up to and including 4½". Solid Bar to 3½".

Campbell

ABRASIVE CUTTING MACHINES

ANDREW C. CAMPBELL DIVISION
BRIDGEPORT • CONNECTICUT
ALSO MAKERS OF A COMPLETE LINE OF NIBBLING MACHINES

ACCO
AMERICAN CHAIN & CABLE COMPANY, Inc.
BRIDGEPORT • CONNECTICUT

GRAND RAPIDS

No. 6

ULTRA MODERN CABINET BASE

TOOL and CUTTER GRINDER

with

BALL BEARING TABLE AND OTHER EXCLUSIVE FEATURES

★ ★ ★

EXTREME FLEXIBILITY FOR COMPLEX GRINDING OPERATIONS

GALLMEYER & LIVINGSTON CO.
330 Straight Ave. S. W., Grand Rapids 4, Mich., U. S. A.

Now... PROMPT DELIVERY

Increased facilities now permit prompt shipment of this valuable, all-round machine for the many jobs that confront busy toolrooms.

LINLEY

HIGH SPEED VERTICAL

MILLING AND JIG BORING MACHINE

saves your larger machines . . . gives you a choice of 8 spindle speeds to 4250 r.p.m. . . . prevents pencil figuring errors by means of direct micrometer setting . . . eliminates back lash of quill travel. Large capacity for a small machine . . . saves precious hours in set-up and changeover. A real money maker for precision jobs such as die work, jig and model making, metal patterns, milling, drilling, reaming, etc.

Table Size 7" x 17½"
Floor Space 18½" x 20"

Detailed Bulletin on request.

LINLEY BROTHERS COMPANY
664 STATE ST. EXTENSION
BRIDGEPORT 1, CONN.

STERLING

THE WHEELS OF INDUSTRY

Mixing a Tough Dose for *Tojo* and *Adolph*

It is in the Mixing Department of our plant that trouble is started for the Axis. Here, skilled workmen blend in proper proportion the various ingredients that later will become the finished "Wheels of Industry." Here, the wheel that will help turn out tanks, guns, planes, ships has its beginning.

In the Sterling Mixing Department, the skill of our laboratory technicians is started on its way to become a fact. Here, the recommendations of our field engineers begin to take form . . in this department are translated into the wheel that is to be, the figures that represent your particular job demands.

Are your wheels performing up to the needs of your wartime production? If not, a change in the formula of your grinding wheels may be the answer. Write us today . . we are ready to work with you in mixing up trouble for the Axis . . there is no cost or obligation when you ask for the services of a Sterling engineer.

Send today for Catalog No. 43. It contains grinding data you can use.

• STERLING ABRASIVES •

THE STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

THE WHEELS OF INDUSTRY

DOWN-TIME IS LOST FOREVER...

Cal-Cutters stay on the job!

TIME taken for tool sharpening—time out for cutter replacements is *TIME lost forever!* Cal-Cutters *stay* on the job because they're heavily tipped with solidly supported tungsten carbides. They're fast cutting, high production tools that successfully mill *steel* as well as light alloys when used at proper speeds and feeds.

Standard end mills, shell end mills, face mills, staggered tooth mills, slitting saws, etc., are regularly made, as well as many *special* tools.

If you have a milling problem on steel, aluminum or dural castings and forgings or other metals take advantage of Cal-Cutter engineering to gain higher output, smoother surfaces and lower cost per piece! Quotations gladly furnished on all cutters without obligation. Write for Catalog 3 ..-Y

MACHINERY MANUFACTURING COMPANY
1915 EAST 31st STREET • LOS ANGELES 11, CALIFORNIA
Vernon Line of HORIZONTAL MILLS, VERTICAL MILLS and JIG BORERS, SHAPERS and GRINDERS

The NEW "ABRASAW" No. 47
CUT-OFF MACHINE

This pedestal type machine — improved and streamlined in appearance and construction — provides machine and base in a single casting. Large coolant tank is now in base of machine with coolant pump at the rear.

Vises can be furnished for straight or combination straight and angle cuts.

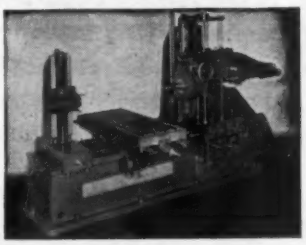
Capacity: Solids up to 1"; tubing and light sections up to 2".
Floor Space: 28" x 50".

Send for complete details.

THE BRIDGEPORT SAFETY EMERY WHEEL CO.
1286 W. Broad St., Bridgeport, Conn.

UNIVERSAL *Horizontal Boring Machine*
The only TRIWAY *Boring Machine Built*

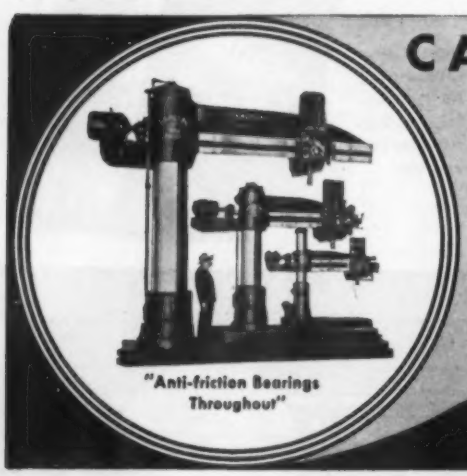
Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.



Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.
Hudson, Mass., U. S. A.

CARLTON RADIAL DRILL



"Anti-friction Bearings Throughout"

FEATURES — 1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

The CARLTON
MACHINE TOOL COMPANY
CINCINNATI, OHIO, U. S. A.

ARMY E NAVY

Proof of Increased Tool Life Through this New Cold Treating Process

High Speed Drill Life Increased from 48 to 256 Holes per Grind by Sub-Zero Treating

Many well known manufacturers today are obtaining remarkable increases in tool life by cold treating high speed cutting tools in Deepfreeze Industrial Chilling Equipment. Tests reveal that subjecting high speed tools to temperatures of −120° F. in a Deepfreeze Cascade Industrial Chilling Machine for a period of from two to three hours causes a decomposition of any retained austenite to martensite. This transformation results in a greater uniformity of hardness and often increases the hardness. In either case the results obtained invariably show an increase in the life of the cutting edges.

Among the many cold treating tests conducted by a large and prominent machine tool manufacturer is the treating of high speed drills used to drill four 1 1/32" diameter holes in a yoke lever part made from S.A.E. 4340 steel forging with the Brinell of 387. Using a special two-spindle opposed head machine, this operation is performed at spindle speeds of 450 r.p.m. with a feed of 5" per minute.

Before cold treating in a Deepfreeze, the best possible performance of these drills was 48 holes per grind. Now, after treating for two hours at −120° F. in a Deepfreeze Industrial Machine, the average results are 256 holes per grind, or an increase of over 500%.

This is but one of the many outstanding results obtained by the cold treating of tools in this plant. On a gang milling operation on another yoke lever, cutters were formerly changed every 7 hours for grinding, while now after cold treatment these cutters will run 24 hours before grinding is necessary.

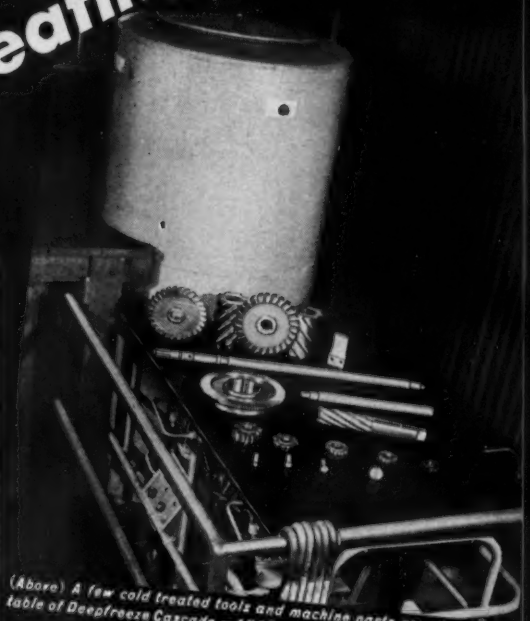
Pieces of tool steel from old and broken milling cutters are salvaged and reclaimed into bits which are welded to a slotting tool for cutting a guide slot 3/4" x 3/4" x 30". Previously, the best possible results were 25 to 52 slots per grind with carbide tipped tools. After cold treating these reclaimed bits for two hours at −120° F. in the Deepfreeze machine, an average of 119 slots per grind was obtained.

"We Cold Treat All Tools Now Before Using"

This manufacturer now requires that every cutting tool that comes into the plant be cold treated before it is used, and also that all cutters be cold treated after sharpening to restore original hardness of the actual cutting edges that may be slightly softened during resharpening operations. Every user of cutting tools can obtain similar increases in tool life by cold treating. If you do not now have a Deepfreeze machine in your own plant, insist upon cold treated tools from your tool supplier. Experience in this and other plants has shown that cold treating even results in increased tool life with new cutters.

Find Out How You Can Use Deepfreeze Chilling Machines in Your Plant... For the complete and latest data on the use of cold treatment of metals in industry today, get this new Deepfreeze Metal Chilling Booklet. It contains complete details, specifications and lists other applications of Deepfreeze Chilling equipment. Write for your free copy today.

(Above) Set-up for drilling four holes in yoke lever part with cold treated tools.



(Above) A few cold treated tools and machine parts are shown on table of Deepfreeze Cascade −120° F. Industrial Chilling Machine.

Read What One Manufacturer* Says About Cold Treating of Cutting Tools

After experiencing this increased hardness on Deepfreeze frozen parts, we conceived the idea of Deepfreezing high speed tools, drills, reamers, and cutters of various sizes and types. We found that on one particular drilling job, where we were using high speed drills and obtaining from five to seven pieces per grind, after applying drills that were deep froze at 120 degrees below zero for two hours, we now obtain from thirty to thirty-six pieces per grind. On one of these continuous milling operations on this same steel job we formerly obtained ten to twelve pieces per cutter grind, and after applying cutters that were given the Deepfreeze treatment we now receive thirty-eight to fourty-four pieces per cutter grind.

We also find that the number of pieces obtained after resharpening of the tools remains quite uniform which indicates that this Deepfreeze treatment penetrates into the interior of the tool and does not merely create a surface hardness.

*Manufacturer's name upon request.

Deepfreeze

TRADE MARK DEEPFREEZE REGISTERED UNITED STATES PATENT OFFICE

Industrial Chilling Equipment for Shrinking, Testing, Hardening and Stabilizing Metals

2327 DAVIS STREET
NORTH CHICAGO, ILLINOIS

Division of Motor Products Corporation, Detroit, Michigan

YESTERDAY'S PIONEER . . . TODAY'S LEADER

WELDON famous FIRSTS 1ST

The important developments that WELDON has pioneered for improved efficiency and greater economy in the use of cutting tools represent a distinct contribution to the industry. It is with justifiable pride, therefore, that the following Weldon "firsts" are listed:

FIRST **WELDON DOUBLE-END END MILLS**—WELDON was first to introduce the Double-End End Mill. Having one shank for two cutting ends the initial cost for this tool is considerably less than that of two single-end end mills of equal size.

FIRST **WELDON COMBINATION STRAIGHT SHANK WITH FAST SPIRAL**—Another important "first" for WELDON was the combination "fast spiral" straight shank end mill—one of the most widely copied tools in the industry.

FIRST **WELDON HOLLOW GROUND TEETH AND DOUBLE BACK OFF**—To take full advantage of the increased spiral angle, WELDON was first to develop the hollow ground tooth and double back off. Result—a longer-lived, non-clogging end mill.

FIRST **WELDON "CUPPED END" END MILL**—WELDON pioneered and patented the "cupped end" end mill which insures greater strength of the end teeth and prevents chips from clogging the teeth on the ends.

FIRST **WELDON QUICK CHANGE ADAPTERS AND HOLDERS**—To speed production, WELDON developed the Quick Change adapters and holders—the first of its type in the industry. Permits quick change from one size holder to another without loosening the spindle draw bar. Accommodates shank diameters of 7 sizes.

FIRST **WELDON END MILL SHARPENING FIXTURE**—This Weldon "first" provides a simple and effective method of reconditioning end mills of all types from 1/16" to 2" inclusive, without use of centers or lead cams.

We can make immediate shipment of most sizes of WELDON End Mills . . . Write for Stock List

THE WELDON TOOL CO. Cleveland 4, Ohio

3000 WOODHILL ROAD

HELP FOR PRODUCTION EXECUTIVES who are training green employees

•

Illustrated

16-PAGE BOOKLETS

"The TOOLS OF OUR TRADE"

• Practical training courses on elementary shop practice . . . designed to help you make efficient operators out of unskilled help. Reprinted from *American Machinist.*

10¢ EACH

(Slightly less in quantities over 500)

1 "The Tools of Our Trade"

2 "How to Run a Drilling Machine"

3 "How to Run a Milling Machine"

4 "How to Run an Engine Lathe"

5 "How to Run a Grinding Machine"

MAIL COUPON TODAY

Please send me at once the following special "Tools of Our Trade" sections from *American Machinist.* I inclose 10 cents (stamps, money order or check) for each section ordered.

1 2 3 4 5

(Order by circling number)

Name _____

Company _____

Address _____

_____

AMERICAN MACHINIST

330 W. 42[illegible] St., New York 18, N. Y.

ATKINS

Curled-Chip Teeth

Engineered for Top Performance on YOUR TOUGHEST JOBS!

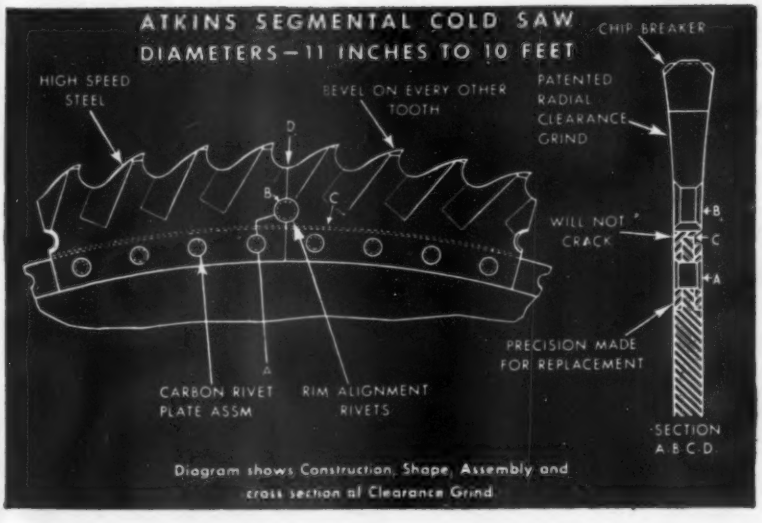


Diagram shows Construction, Shape, Assembly and cross section of Clearance Grind

● For heavy-duty sawing—for ingot cropping, billet sawing, bar cut-off, and other metal cutting jobs that "kill" ordinary saws—Atkins Curled-Chip Tooth design has been adapted to segmental saws. Shown is an Atkins segment, as it appears before fastening to the blade. The extra advantages of this type of segments are (1) A standard cutting width consistently narrower than other types of inserted tooth saws, (2) Economy—worn-out teeth are easily, quickly replaced without discarding the saw discs, and (3) Great resistance to the shock of heavy duty work. These, plus the fast cutting, heavy feed rates and accurate cuts assured by Curled-Chip Teeth, make Atkins Segmental Saws your best bet for your toughest jobs. Write for *Atkins Curled-Chip Manual* for full details.

E. C. ATKINS AND COMPANY

424 S. Illinois Street Indianapolis 9, Indiana

Agents or Dealers in All Principal Cities the World Over

TOOLS ARE [illegible]IGHT! TREAT [illegible] WEAPONS··

MOREY TURRET LATHES

for BAR or CHUCKING { UNIVERSAL or PLAIN

#3 UNIVERSAL

For bar stock up to 1½" in diameter
10" turning length
16½" swing over bed
Infinite spindle speeds: 55 to 1800 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 727A

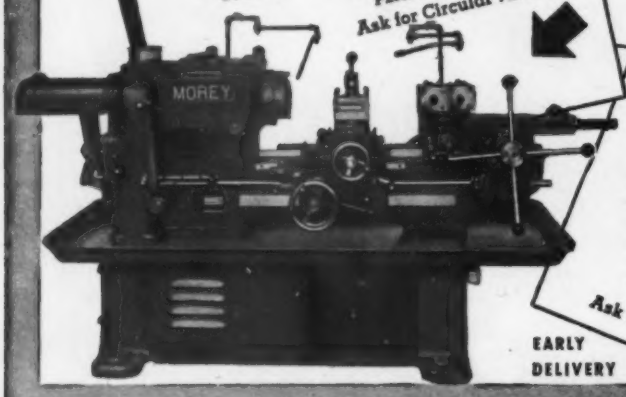
#2 PLAIN-GEARED

For bar stock up to 1" in diameter
Turning length 6½"
Swing over cross slide 6"
Swing over bed 14"
Infinite spindle speeds:
Minimum of 60 RPM.
Maximum of 2000 RPM.
Constant horsepower at all speeds.
Ask for Circular 629A

#4 UNIVERSAL

For bar stock up to 2" in diameter
12" turning length
19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 736A

EARLY DELIVERY



- INFINITE SPINDLE SPEEDS —Electronically Selected—
- DIRECT BELT DRIVE AVAILABLE AT HIGH SPEEDS ELIMINATES GEAR MARKS (patents applied for).
- GEARED SPINDLE SPEEDS INSTANTLY AVAILABLE THROUGH MULTIPLE DISC CLUTCHES.
- SPINDLE MOUNTED ON TIMKEN BEARINGS.
- RIGID —WITH SUFFICIENT POWER TO TURN AT THE HIGHEST SPEEDS AND FEEDS MODERN TOOLS WILL WITHSTAND.
- SPINDLE SPEEDS AND POWER FEED CHANGES WITHIN EASY REACH OF OPERATOR.

ARMY E NAVY

THE DESIGN OF THE MOREY No. 2, 3 and 4 TURRET LATHES ARE BASICALLY ALIKE. EACH MACHINE IS ENGINEERED FOR THE SIZE WORK IT IS DESIGNED TO HANDLE.

DESIGNED AND BUILT BY
MOREY MACHINERY CO., INC
410 BROOME STREET, NEW YORK 13, N. Y.
PLANT: 4-57 26TH AVE., ASTORIA 2, NEW YORK

ABRASIVE

ACCURACY BOOSTS PRODUCTION

No. IG	INTERNAL GRINDER	No. 34	VERTICAL SPINDLE SURFACE GRINDER
No. 1½	HAND FEED SURFACE GRINDER	No. 3B	AUTOMATIC FEED SURFACE GRINDER

No. B-11 PLAIN MILLING MACHINE

Look for Our Full Page Advertisements

ABRASIVE MACHINE TOOL CO.
EAST PROVIDENCE 14, RHODE ISLAND

LELAND-GIFFORD COMPANY · WORCESTER MASS. U.S.A. · MACHINE TOOLS · CRANK SHAFTS

Drilling and Tapping Machines

(Automatic and Semi-Automatic)

LELAND GIFFORD CO.
WORCESTER, MASS.

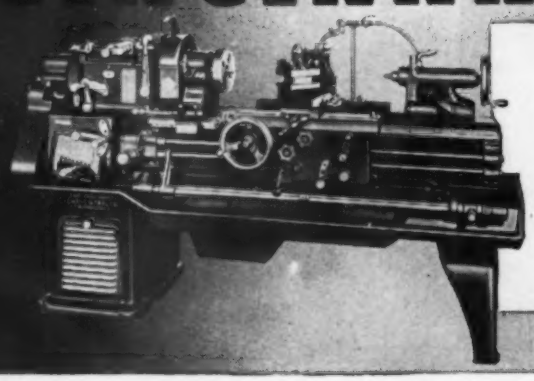
SMITH & MILLS

CRANK SHAPERS

sizes 12" to 32" stroke

THE SMITH & MILLS CO. Cincinnati, Ohio

CINCINNATI LATHES



ASSURING HEAVIEST CUTS AT HIGHEST SPEEDS WITH MAINTAINED ACCURACY

Cincinnati Lathes are produced to handle heavy duty work with ease and precision. They are powerful, rugged, fast and convenient with every detail of design and construction developed to assure long-lived accuracy under full capacity operation. Available in sizes from 14" to 30", with 12 or 24 speeds and 32 to 96 feeds. Our latest catalog gives complete details. Write today for your copy.

THE CINCINNATI LATHE & TOOL CO.
Rogers Road, Oakley SPECIALISTS SINCE 1906 Cincinnati, Ohio

Newton Combination Unit Head Milling and Shaving Machine with Two Single Vertical Milling Heads and Two Finish Shaving Heads

NEWTON MILL-N-SHAVERS

The things we'll have after Victory are going to be a lot more abundant than those we have now. Industry, turning its efforts from war to peace, will once more prove that mass production provides more people with more and better things at lower cost.

And in this march toward peace-time prosperity, Newton Milling and Shaving Machines will play an important part. The ability of these machines to rough mill in one pass and finish shave on rapid traverse return will make them indispensable in fashioning the multitude of things to come.

MODERN TOOL WORKS

DIVISION OF

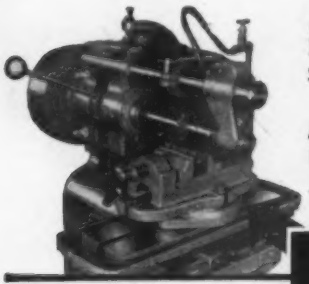
CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

Producto Machine Vises

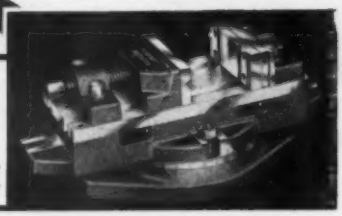
Everything in Machine Vises — from small 3″ Drill Press Vise to 9″ Heavy Milling Machine Vise including hardened and ground Precision Tool Room and Jig Borer Vises, — Plain, Swivel and Angle Vises in various sizes, — Quick-Acting Cam Lock Vises for production purposes.

All are of modern design and made for rugged wear and accuracy.



Ask for Producto bulletins on Modern Machine Vises and Shop Tools.

Manufacturers of PRODUCTO DIE SETS and DIE MAKERS ACCESSORIES.



THE
PRODUCTO
MACHINE COMPANY
950 BOUGATONIC AVE., BRIDGEPORT, CONN.
3017 MERCURY DETROIT, MICH.

REID Hand Feed Surface Grinder No. 2C

Our dealers will help you fill out necessity priority forms. Write us today for your nearest dealer's name and address.

Equipped with Motorized Spindle

A Proven Product for Over a Quarter Century with Thousands in Use Daily

Send for Descriptive Literature
EXCELLENT DELIVERIES

Exclusive Selling Agents
H. LEACH MACHINERY CO.
387 CHARLES ST. PROVIDENCE, R. I.
Agents in all Principal Cities Throughout the World

MILLHOLLAND

Automatic DRILLING - BORING MILLING - TAPPING Units

½ to 20 HORSEPOWER DRIVE

AUTOMATIC and SEMI-AUTOMATIC PRODUCTION MACHINERY

W. K. MILLHOLLAND MACHINERY CO.
Indianapolis, Ind.

For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

Giant KEYSEATERS

MITTS & MERRILL
913 Tilden St.
Saginaw, Michigan

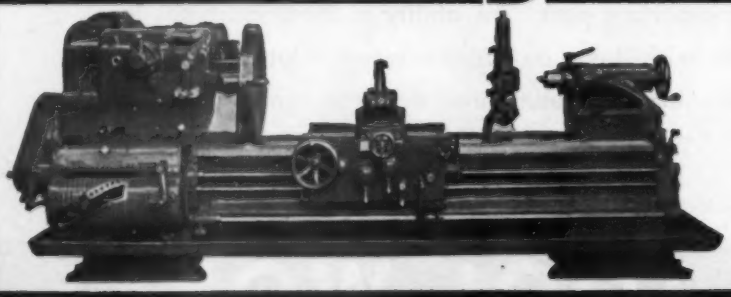
LUCAS "PRECISION"

Horizontal Boring, Drilling and Milling Machine
THE LUCAS MACHINE TOOL CO.

NOW AND ALWAYS OF

CLEVELAND
OHIO, U. S. A.

SPRINGFIELD GEARED HEAD LATHES



for peacetime or war production!

A lathe purchased now, for round-the-clock war production, must still meet peacetime requirements. Therefore, specify SPRINGFIELD lathes —flexible, efficient, ideal for emergency or normal production. SPRINGFIELD lathes are built in sizes from 14" to 30". Write for descriptive bulletins, prices, deliveries, etc.

The SPRINGFIELD MACHINE TOOL COMPANY • • • SPRINGFIELD, OHIO, U.S.A.

Vitrified

Cuts longer between turns

Vitrified Grinding Wheels assure economy in high quantity production fine precision grinding because they cut longer between each wheel truing. Then, too, these long life, strong wheels require less redressing. They can also be depended on to eliminate gumming, glazing and heating.

All these advantages are available regardless of the grinding job, because there is a size, shape and type Vitrified Grinding Wheel for every grinding purpose. The completeness of the Vitrified line makes it possible for any shop to standardize on Vitrified Wheels

Our engineers will gladly study your grinding operations and point out the savings you can make through the use of Vitrified Wheels.

BORITE—for all kinds and classes of steel grinding.

CARBORITE—for all classes of cast iron, brass, bronze and aluminum grinding.

Also, Silicate, Shellac and Resinoid Bonded Wheels

VITRIFIED

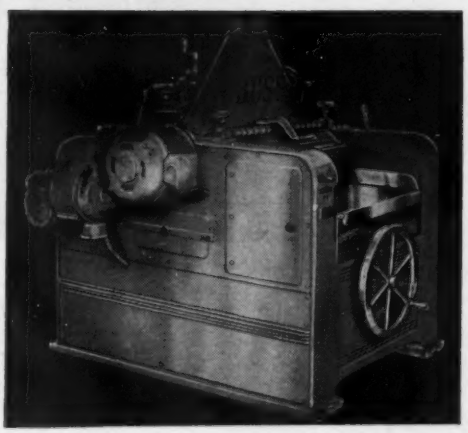
VITRIFIED WHEEL COMPANY
WESTFIELD MASS.

The CABLEMASTER is the new, lightweight cablehoist, available in 250, 500 and 1000 lb. *capacities, especially designed for each rating* . . . and built for crane, hook or rail mounting. Write today for details.

MASTER

THE MASTER ELECTRIC COMPANY
INDUSTRIAL EQUIPMENT DIV. – DAYTON, O.

BUSS *Wood Surfacers*



GIVE YOU THE ABSOLUTE PRECISION ESSENTIAL IN PATTERN and JIG MAKING!

—plus faster changeover, greater convenience of operation and the assurance of years of perfect service. Write for Bulletin Type 4L showing the many patented features which make this the finest of all surfacers for pattern and jig departments. Production Models to suit every circumstance. We specialize in surfacers.

BUSS MACHINE WORKS
228 EIGHTH STREET HOLLAND, MICH.

One more for Eddie before we quit!

P&H HEVI-LIFT HOISTS

"Goodness only knows where Eddie is by this time! But to him — and to the rest of the boys at the fighting fronts — we're saying it with production."

Thanks to "thru-the-air" handling with P&H Electric Hoists, production is moving faster, more efficiently than ever before; war workers are accomplishing more per shift.

There's no place in today's production for the drudgery that tires men and women long before the day's work is finished — not when these tasks can be done so much more quickly, without effort — by simply pressing buttons.

Whatever your materials handling problem may involve, your inquiry will receive immediate attention.

Available in all capacities up to 15 tons. Executives interested in information about the many ways P&H Electric Hoists can serve war industries should write us without delay.

ARMY E NAVY

General Offices: 4514 West National Avenue, Milwaukee, Wisconsin

HARNISCHFEGER CORPORATION

HOISTS • WELDING ELECTRODES • MOTORS P&H EXCAVATORS • ELECTRIC CRANES • ARC WELDERS

nouncing the **DALZEN** *Electronic*

THREAD GRINDER

NOW—DALZEN BRINGS ELECTRONICS TO THREAD GRINDING, PROVIDING NEW EFFICIENCY, EASE OF OPERATION, SET-UP, AND COMPLETE CONTROL OF WORK QUALITY

The new Dalzen No. 5 Thread Grinder, with General Electric Thy-mo-trol drive, provides the highest possible production of threaded parts, thread gages, straight and spiral fluted taps, and thread milling cutters. Accuracy and finish are exceptional.

Grinding speed—both wheel and work—forward and reverse—is adjusted by the twist of a dial. Variation is infinite and stepless. The Thy-mo-trol drive which makes this possible is backed by General Electric's own service guarantee.

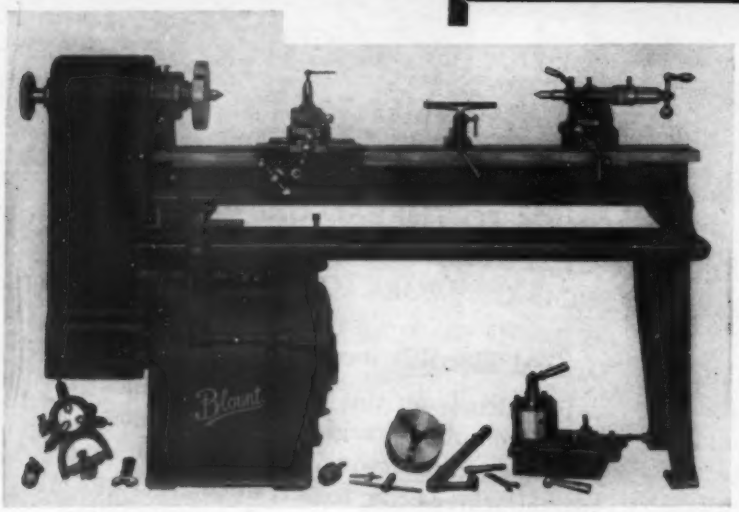
Full details on this new Dalzen, which makes complete precision thread grinding available to everyone, are given in a striking three-color folder, titled "Dalzen Electronic Thread Grinder." A copy will be sent you, free of charge, on request.

nd for free
scriptive
lder

DALZEN

TOOL & MANUFACTURING CO.

12255 EAST EIGHT MILE ROAD • DETROIT (5), MICH.



"Blount"

MODEL B-4
SPECIAL PURPOSE LATHE

• • •

Meeting the need for a machine to handle a particular type of work . . .

•

Send for Bulletin D-18 giving detailed information on the complete Blount line of special application lathes.

•

J. G. BLOUNT CO.
EVERETT, MASS.
U. S. A.

Equipped with a ½ HP. 4 speed ball-bearing headstock motor-in-leg, the Model 4B Blount Lathe provides speeds of 575, 850, 1125 and 1725 R.P.M.

This machine can also be furnished with reduction geared motor mounted on adjustable hinged motor bracket and belted to head. With this arrangement, spindle speeds of from 185 to 1356 R.P.M. are available. Other spindle speeds can also be furnished.

The standard machine has an 11" swing and an 6' bed length. Other bed lengths are optional.

Standard equipment includes a 4-speed drum controller, magnetic starter with pushbutton and fuseless disconnect switch. Spindle nose is 2⅜" dia. 10v threads per inch. Spindle is fitted with hand wheel draw-in mechanism to accommodate Rivet No. 6 collets, ⅛ to 1" capacities. Other equipment includes hand-feed carriage and compound rest, full set-over swivel tailstock, belt, belt guard and belt shifter. Various accessory equipment can be furnished.

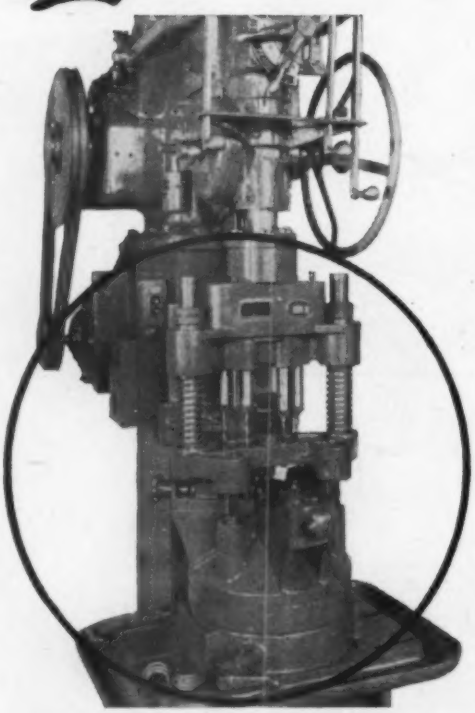
Buhr CLOSES THE GAP

ON A

STANDARD DRILL PRESS

WITH A

COMPLETE TOOLING



4-Spindle BUHR drill and ream Head with vertical adjustment in spindles Bushing Plate.

3-Place Holding Fixture mounted on a 14" Hand Index Table For drilling and reaming 2 holes in Connecting Rod Cap.

BUHR MACHINE TOOL CO.

833 GREEN ST. **ANN ARBOR, MICH.**

SPECIALISTS IN MULTIPLE SPINDLE DRILLING, BORING, REAMING, TAPPING EQUIPMENT

THE WOUNDED PLANE THAT *Flies* AGAIN

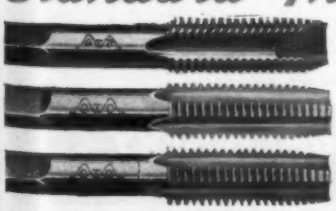
The Germans and the Japs do bring down some American planes — but they'd better be sure they fall in enemy territory. Otherwise, many of them have a way of coming up again, to do battle once more.

The damaged planes — called "hangar-queens" — are kept intact, till their undamaged parts are needed to repair another plane.

What makes possible this free interchange of parts is that miracle of modern manufacture which we're prone to take for granted — STANDARDIZATION.

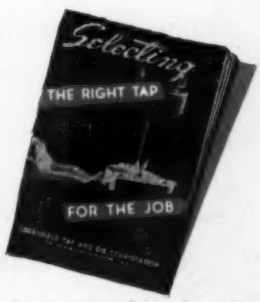
The striking story of the hangar-queen, made possible by standardization, only highlights its benefits to the world in *time of peace.* For not until the use of interchangeable parts made mass production possible did all the people begin to share the comforts formerly available only to the few. *And the end is not yet.*

Standard Threads - SAVE TIME - SAVE MONEY!



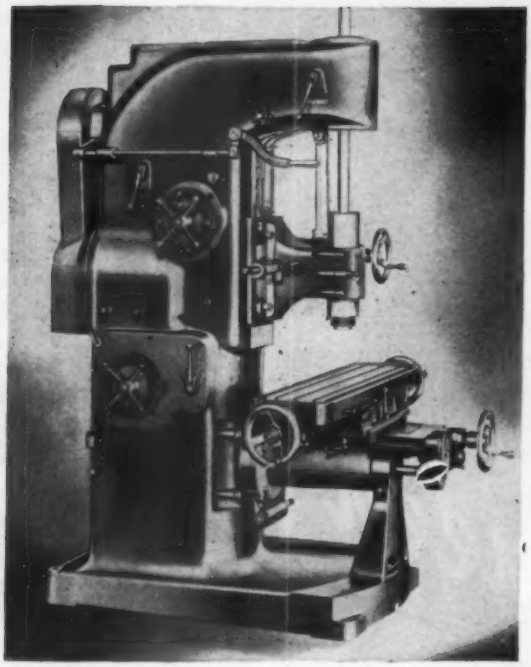
GUN TAP
•
CUT THREAD TAP
•
GROUND THREAD TAP

Here are 3 different types of Tap, all of the same size. One of these will best suit your requirements. You'll save money on your work if you first determine which of these types you should use, and thereafter specify this type for that job. This is "Standardization" in practice.



GREENFIELD TAP AND DIE CORPORATION GREENFIELD MASSACHUSETTS

AN AID TO MAKING



Each Working Hour

MORE PRODUCTIVE

ALL-PURPOSE KNIGHT-Millers

● Dial indicators for quick and accurate locating, a large accurately fitted spindle to insure round and straight holes, and table slides that are square makes the KNIGHT Miller ideal for such jobs as that of handling a boring job on an eighteen inch by twenty-nine inch plate two inches thick. Nine holes, ranging from one and one-eighth inches to two inches in diameter, were accurately bored to limits of plus or minus .0005".

KNIGHT Millers' wide range of spindle speeds, solid table unit, and ease of handling provide efficient production and accurate results on many operations at one setting. An example is the work done on a large one inch steel plate. Profiling, milling, boring, slotting, and keyway cutting were among the operations performed and — ALL AT ONE SETTING.

KNIGHT Millers have the power and capacity to do the most exacting jobs — speedily and at low cost. Example: a two-inch diameter cutter, six inches long, was used to remove as much as five-sixteenths inch of stock in some places from a large forging without appreciable spindle deflection. The forging was machined completely all over and met with rigid inspection for finish and tolerance.

By using the swivel and tilting table features, the need of many special angle plates, angle cutters, and costly fixtures is eliminated. Also, by equipping the table and saddle movement with dial indicators, much preliminary layout time is saved. With the use of dial indicators, the universal table of the KNIGHT Miller serves the purpose of a universal jig and fixture built as a part of the machine.

Write for catalog.

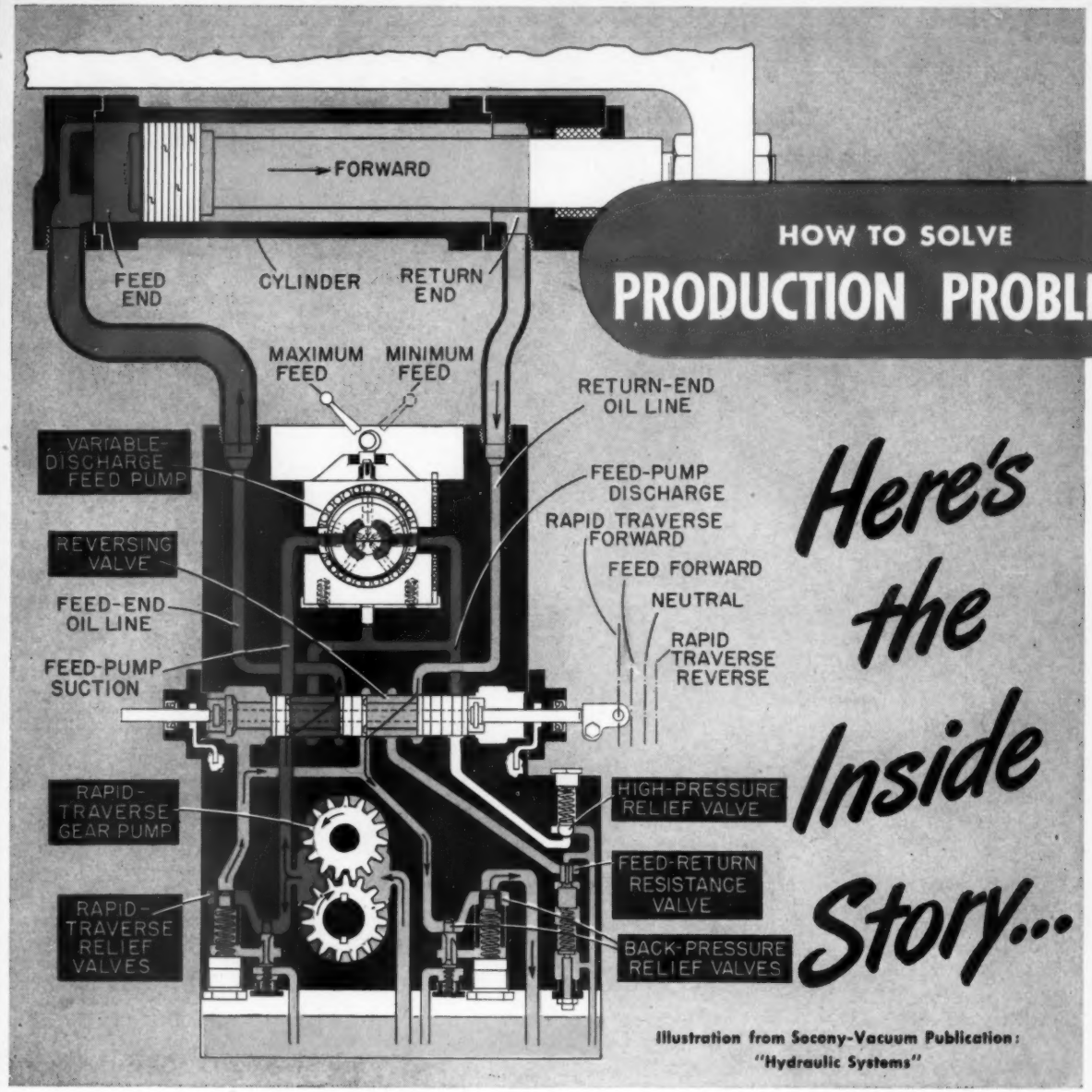
KNIGHT VERSATILE MILLER ACCURATE-RIGID

IMMEDIATE DELIVERY SUBJECT TO PRIOR ORDER

W. B. KNIGHT MACHINERY CO.
• ST. LOUIS, MISSOURI •

HOW TO SOLVE

PRODUCTION PROBLEMS



Here's the Inside Story...

Illustration from Socony-Vacuum Publication: "Hydraulic Systems"

Why some machines produce a greater volume of acceptable work than others:

THIS IS A DIAGRAM of the hydraulic system of a modern machine tool.

Just look at all those valves, orifices, small oilways and multiple moving parts. And remember, oil must flow freely through all of them, often under widely varying conditions of temperature and pressure.

The oil you use can make a big difference in the amount and quality of your production.

Gargoyle Vacuoline Oils are ideal fluids for systems like this. Their high chemical stability resists oxidation and reduces deposits to a minimum..deposits that might gum up the valves and passageways. Their strong films resist wear and their comparatively little change in body under changing temperatures shortens starting-up periods.

Use Vacuoline Oils in hydraulic systems.

GARGOYLE Lubricants

CALL IN SOCONY-VACUUM FOR "CORRECT LUBRICATION"!

TURN PAGE

HOW TO SOLVE

CUTTING OIL PROBLEMS

50% Added to Cutting Tool Life!

IN SOME CUTTING OPERATIONS, like this shell facing and grooving, the pressures on the lip of the tool may run into hundreds of thousands of pounds per square inch. Temperatures in the boundary area may reach 1,000°F., or even higher.

Under such conditions, cutting tools are likely to wear out rapidly, causing frequent replacements, reducing production.

The answer is correct cutting fluids with high pressure resistance and lubricity characteristics, such as the S/V Sultran Cutting Oils and S/V Solvac Oils.

These oils were recommended recently to shell manufacturers who were having trouble with excessive tool wear. Results in one typical instance: Tool life increased from 8 to 12 hours. Production increased from 140 to 180 pieces.

You may expect similar results with Socony-Vacuum cutting fluids.

GARGOYLE Lubricants

SOCONY-VACUUM

OIL COMPANY, INCORPORATED

HOW TO SOLVE **RUST PROBLEMS**

Protection from Rust!

IN STORAGE . . .

IN TRANSIT . . .

IN HANDLING . . .

NEW COMPLETE LINE OF RUST PREVENTIVES

Gargoyle Sova-Kotes!

HERE ARE A FEW OF THE VARIED REQUIREMENTS THAT GARGOYLE SOVA-KOTES MEET:

1. Must be Salt Resistant
2. Must be Acid Resistant
3. Must have Thick Film . . . or Thin Film
4. Must be Applied by Dipping . . . or Painting
5. Must be Poured On . . . or Sprayed On
6. Must be Heated . . . or Not Heated
7. Must Resist Outdoor Exposure
8. Must be Transparent
9. Must be Used with Wrapping . . . or without Wrapping
10. Must be Used with Crating
11. Must be Easily Removed . . . or Durable

NO MATTER HOW DIFFICULT your individual rust preventive job is, you'll find the answer in Gargoyle Sova-Kotes. For this complete new line of rust preventives contains nine proved products to meet almost every conceivable condition and method of application.

So, call your Socony-Vacuum Representative today. Let him analyze your specific rust-preventive problem and *prescribe* the exact Sova-Kote or combination of Sova-Kotes to give you efficient, dependable rust protection.

SOCONY-VACUUM OIL CO., INC., Standard Oil of N. Y. Div.•White Star Div.•Lubrite Div.•Chicago Div.•White Eagle Div.• Wadhams Div.• Magnolia Petroleum Company • General Petroleum Corporation of Calif.

GARGOYLE Lubricants

BACKED BY 78 YEARS' EXPERIENCE IN MAKING PETROLEUM PRODUCTS

A Pledge—

FOR THE FINAL VICTORY EFFORT... AND A PROMISE FOR YOUR POST-WAR PLANS!

From a man who has worked closely with New England industry for over 20 years to help manufacturers obtain maximum production and minimum maintenance costs through Correct Lubrication.

THE PERIOD JUST PAST and the critical months ahead are hours of trial—and triumph—for you of American Industry.

You've met the urgent needs of our fighting men with record production, and you've kept essential supplies flowing to the home front. Now, with the enemy on the defensive, you're called upon for a final production effort to break his lines.

We're proud, here at Socony-Vacuum, to feel that in assisting you with your lubrication problems, we have played a part in your great accomplishments.

We want to thank you for your co-operation and pledge our aid in the final push for complete victory.

Yes, and when it's over and you start operating under your post-war plans, we promise to help you meet new, keen competition with efficient production. The same high-quality Gargoyle lubricants that are proving so essential in your plants right now, will continue to serve you.

L a Myers

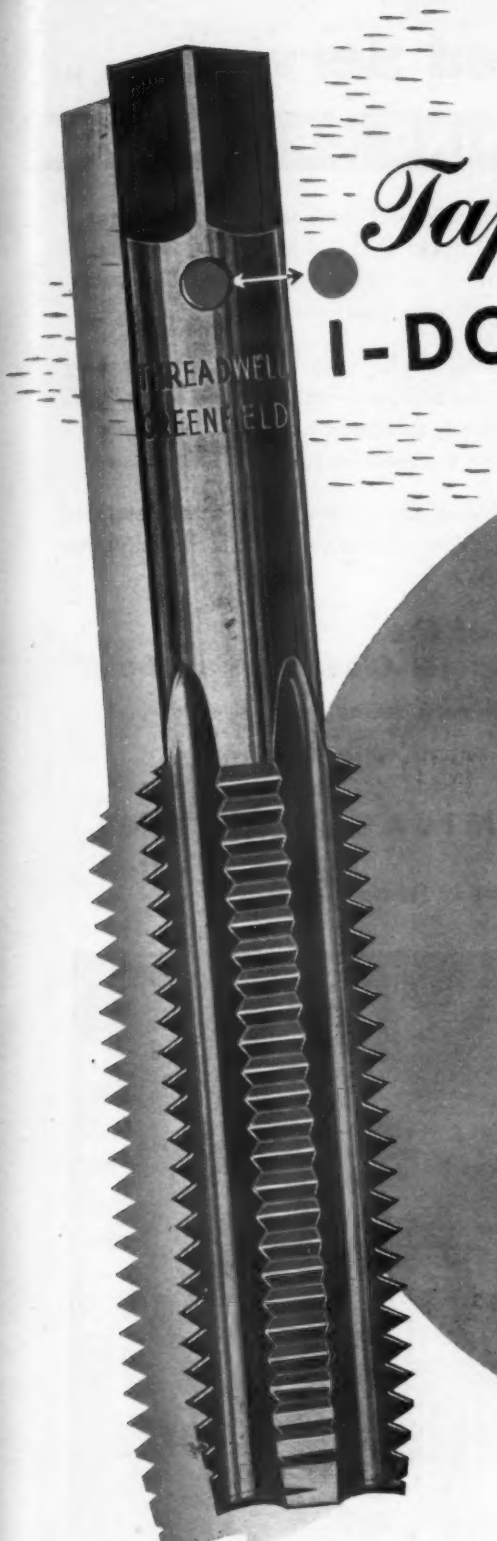
Industrial Sales Mgr. New England Division
SOCONY-VACUUM OIL CO., INC.

This is the first of six messages to American Industry by Socony-Vacuum Industrial Sales Managers.

GARGOYLE
Lubricants

SOCONY-VACUUM OIL CO., INC.

Standard Oil of N. Y. Div. • White Star Div. • Lubrite Div. • Chicago Div. White Eagle Div. • Wadhams Div. Magnolia Petroleum Co. • General Petroleum Corporation of California.



Tap I-DOT-IFICATION

...AN EXCLUSIVE *Threadwell* FEATURE

You can tell it's a *Threadwell* by the color dot on the shank. Selecting the right tap from tool stock is easy. Using the right tap on the job is certain. But that's only *one* plus factor when you standardize on *Threadwell* Taps.

You get accurate and long lasting performance. *Threadwell* taps have polished flutes which speed chip removal and minimize breakage.

You get clean, dry, shining taps — never messy or sticky — because *greaseless* rust-proofed.

You get your taps in the *Threadwell tap-capsule* (every ground thread tap in its individual transparent plastic container — dirt-proof, ready for selection without unwrapping.)

You get a tap service tailored to your individual needs by a carefully planned policy of personal attention to your orders at the shop and at your *Threadwell* distributor's.

If you're not already in touch with the *Threadwell* distributor nearest you, let us "identify" him and at the same time send you a copy of the new and valuable *Threadwell Tap Book.*

RED High Speed Cut Thread
WHITE Commercial Ground
BLUE Precision Ground

DISTRIBUTORS IN LEADING INDUSTRIAL CENTERS THROUGHOUT AMERICA
EXPORT STOCKING DISTRIBUTORS
CANADA *Bridge Machinery Co., Montreal*
ENGLAND *Skylux Ltd., London*
and
John H. Graham and Co., Inc.
THROUGHOUT THE WORLD

Threadwell
SINCE 1902
"TAPS OF DISTINCTION"

THREADWELL TAP AND DIE COMPANY • GREENFIELD, MASSACHUSETTS, U. S. A.

One Complete and Unbiased Service . . .

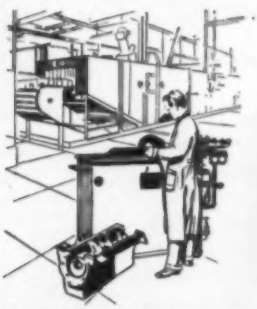
for **METAL CLEANING OPERATIONS**

MAGNUS METHODS

are the result of a steady program of research leading to the establishment of the most effective means of handling each individual problem in metal preparation, production and finishing.

MAGNUS MATERIALS

cover the range of materials and compounds for metal cleaning. We can help you pick the right material for your particular operation without bias.



MAGNUS MACHINES

Magnus builds the machine you need, from small all-purpose portable units for parts cleaning to completely automatic equipment for carrying on a series of treatments.

The machine illustrated at the right is a fully automatic unit for cleaning 200 six-inch shells per hour. Shells enter on the overhead rail at the right, above the switchboard, to be washed, rinsed, dried and cooled before they are discharged at the left side of the machine. Cleaning in this case is done by a hot alkaline cleaning solution.

Magnus works with you to select the best method, the most suitable material and the machine or tank layout that will keep your production at top speed for precleaning, washing, rustproofing, pickling, degreasing, burnishing, drying, cooling and related operations.

As we supply any required material, we have no bias in recommending either methods or compounds. As we build any required type of machine, from small portable units to completely automatic equipment, we can work with you without prejudice in fitting the machine to your particular needs.

If you have any immediate problems along these lines, or contemplate post-war changes in your production methods, let's talk the situation over together.

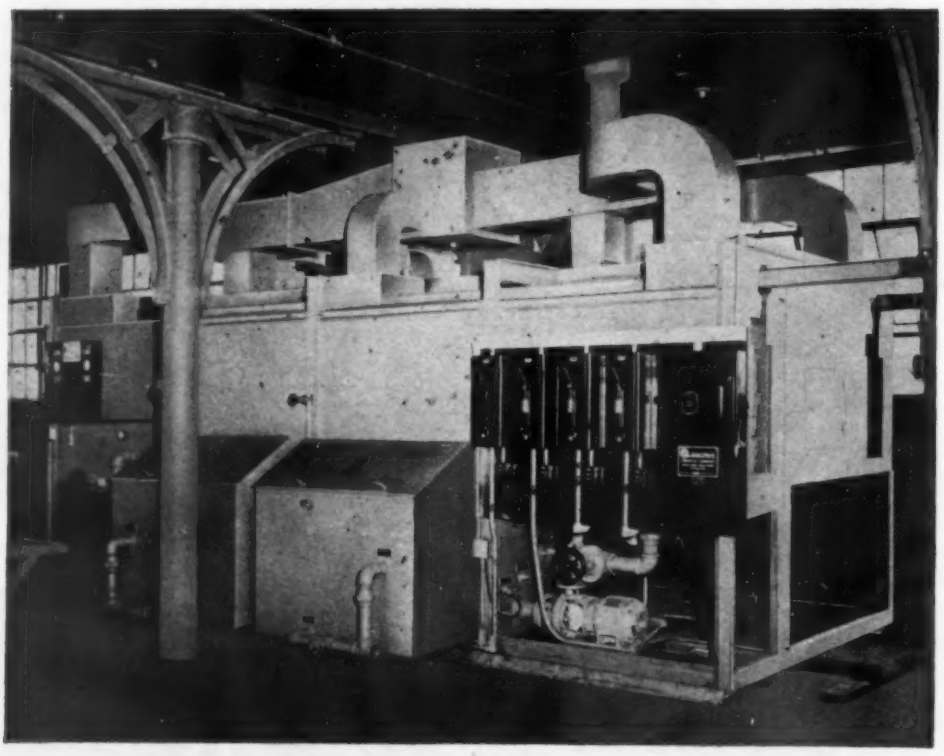
Write for Your Copy of the Magnus "Metal Cleaning Handbook"

The only complete manual on metal cleaning and finishing methods, materials and machines. It's full of practical ideas that will help you speed production, cut costs and improve quality.

MAGNUS CHEMICAL COMPANY

60 SOUTH AVENUE **GARWOOD, N. J.**

Representatives in Principal Cities



Magnus CLEANERS-METHODS-MACHINES

THE public is due for many pleasant surprises after the war—as new materials are released at the fighting fronts and converted into the products of peace.

Perhaps *you* are planning to utilize some of these new materials in your own processes. More power to you, if they give your customers a *better* product—or cost less—or create a bigger market for themselves.

But even the newest materials don't just "jump together." Quantity production will call for *more* drilling and reaming, no doubt. After the war, you can order Cle-Forge High-Speed Drills and Peerless High-Speed Reamers in the same confidence you have always had—that they will continue delivering top quantity *and* quality production per tool, per grind.

More than ever you can depend on your ✦Industrial Supply Distributor for all of your thousands of items—using him as your central source instead of scattering your orders among many manufacturers. Thus, as you improve your production with new Materials—improve your relations with your Supply Distributor, too.

It's easy—and it *pays*—to

Telephone your ✦ISD✦ FIRST!

✦C✦

ARMY NAVY — ARMY E NAVY

The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49th STREET
CLEVELAND

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

30 READE ST. NEW YORK · 9 NORTH JEFFERSON ST. CHICAGO · 650 HOWARD ST. SAN FRANCISCO
6615 SECOND BLVD., DETROIT · LONDON - E. P. BARRUS, LTD. - 35-36-37 UPPER THAMES ST., E.C.4

Compact in design—sturdily constructed—foolproof in operation—this powerful DeWalt will *speed up* your cut-off operations not only in today's emergency but long after the war is over. Write for descriptive literature.

DE WALT
PRODUCTS CORPORATION
LANCASTER, PA.

ESSENTIAL PRECISION TOOLS *for* TODAY and TOMORROW *with good deliveries*

← REID 2-B AUTOMATIC ALL-ELECTRIC SURFACE GRINDER

Grinds work 18" long, 6" wide, 11" high using a wheel 7" in diameter; emergency height 14". Spindle speed 3500 R.P.M. Automatic longitudinal table feed; transverse automatic with a range of .006" to .110" at each reverse of table; with motorized spindle. Available in other models. Reid 2-C Hand Feed. Reid 2-A Mechanical, Automatic and Hand Feed.

LEACH EXTERNAL GRINDER

Fast, smooth and accurate. Handle small parts up to 7" in diameter, 11" in length, Six table feeds (3/8", 1 1/16", 1 1/8", 1 1/2", 2 1/2", 3 3/8" per min.) work spindle speeds 73, 104, 144, 213, 294 R.P.M.; wheel spindle speed 2750 R.P.M. Wheel diameter, 10" x 3/4" x 2".

← GREAVES NO. 2 PLAIN MILLER

Meets every need for a simple, heavy duty machine. Table working surface 52 1/4" x 12"; Longitudinal power feed 28"; cross power feed 10"; vertical power feed 19"; 18 spindle speeds, from 20 to 1,000 R.P.M.; 9 feeds ranging from 1/2" to 18" per min.; rapid traverse, 6 way, 75" per min.

WADE 8-A PRECISION → LATHE

Precision, versatility and stamina are combined in this toolmakers' lathe. Provision is made for the use of collets and chucks as well as attachments for turning, drilling, grinding, threading and milling. Equipped with power feed longitudinal and crosswise. Length of bed 44"; distance between centers 24"; swing over bed 8 1/2"; cross slide travel 5"; tailstock spindle travel 3 1/4"; collet capacity 1"; hole through spindle 1 3/16". Other models available. #3, 5 and 7 Precision Lathes and #7 Screw Machine. Wade Bench Profilers available for high speed precision work.

Each of these machines—tried and proved in service—offers the latest in design and construction—each has been developed to provide the speed, accuracy, power and stamina necessary to meet the urgent demands of war production. Sturdiness and long life will assure the economical operation of these machines when swords once again are turned into plow shares.

Complete detailed specifications of these machine tools are available on request.

Exclusive Selling Agents

H. LEACH MACHINERY CO.

387 CHARLES STREET, PROVIDENCE, R. I.

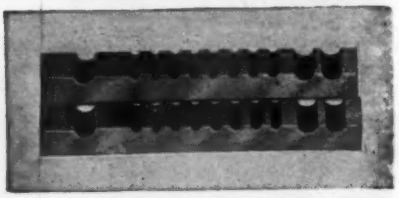
Distributors in all principal cities

DRESSING IS SIMPLIFIED . . . *by the New Time-Saving* C-66 . . . RADIUS DRESSER FOR SURFACE GRINDERS

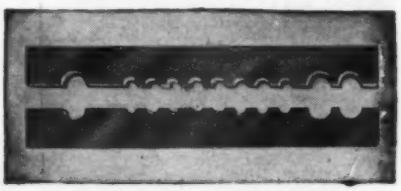
This low-priced, rugged attachment, for any make of surface grinder, dresses wheel without dismantling machine. Mounts directly on magnetic chuck. Does a one-hour job in 10 minutes — accurately — conveniently.

NOTE how this Radius Dresser and two High Speed Tool bits replace an expensive Jig Boring Machine.

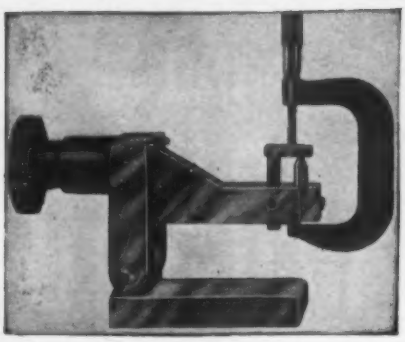
Drill Jig made with two high speed tool bits ground together on surface grinder, eight .062 holes, two screw holes, one dowel pin-hole. No drill bushings, no lapping, no hardening. Grinding time two hours fifteen minutes. Simple, easy, quick.



Two High Speed Tool Bits ground for drill jig.

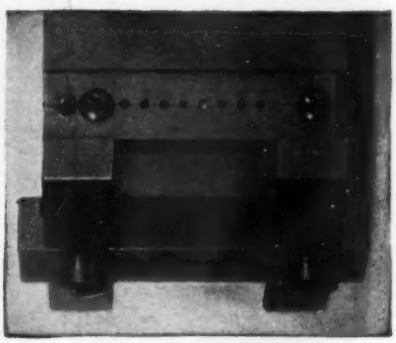


Drill jig completely assembled.



The diamond is set by simply measuring with micrometer from top of hood to bottom of arm.

The C-66 provides an important safety feature in that hands are kept away from under the wheel.



Drill jig completely assembled.

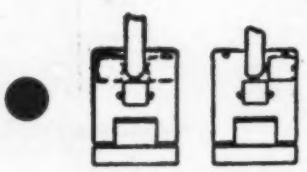
For dressing wheels for grinding turning tools, the dresser is set at angle equal to clearance angle of tools. The C-66 is the only radius dresser with this feature.

Long Wearing Chisel Point Diamond

The diamond holder is held against a ground vee in the arm. By means of this construction any size diamond up to 3/8" can be held accurately in line with the vertical center line of spindle.

.013 Male and Female Radius

.500 Male and Female Radius



180° and 90° Male Dressing.

Prompt delivery from factory in Newark, N. J. Price, without diamond, $82.50, 1/4 K diamond, $5.00.

SCHULTZ & ANDERSON CO.

MACHINE TOOLS

109 C EDISON PLACE NEWARK, N. J.

Why Namco Circular Chasers Cut BETTER Threads

..and LAST LONGER..

10 TO 50 TIMES LONGER

High-speed tool steel bars have their densest, toughest and purest steel close to the "skin" —around their outside diameter. That's a metallurgical fact.

So, in making Namco Circular Thread Chasers, we first cut a slice from the bar, trim off the outer "skin", machine, harden and grind the chaser—and it's ready to go.

The "business end" of the chaser—the cutting edge—is *always* located in the toughest, wear-resisting part of the steel, for the life of the chaser.

This naturally means close tolerances and maintained precision, even on high-speed production runs.

No matter how many times the chaser is reground—up to 270° of its circumference—the cutting edge is always in the best part of the steel.

Experience has proved that Namco Circular Thread Chasers last 10 to 50 times longer. They are responsible for big cost savings in production shops that have the highest standards of accuracy.

Namco Circular Chasers are mounted on blocks set in Namco Dieheads, revolving or stationary. Replacing chasers is a 2-minute job—with no "trying for size", no spoiled work, and no variation from steady uniform production.

THE NATIONAL ACME CO.

170 EAST 131ST STREET • CLEVELAND, OHIO

ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • THE CHRONOLOG • LIMIT AND CONTROL STATION SWITCHES • SOLENOIDS • CENTRIFUGES • CONTRACT MANUFACTURING

YOUR COPY OF THIS BOOK IS OFF THE PRESS . . . SEND FOR IT TODAY!

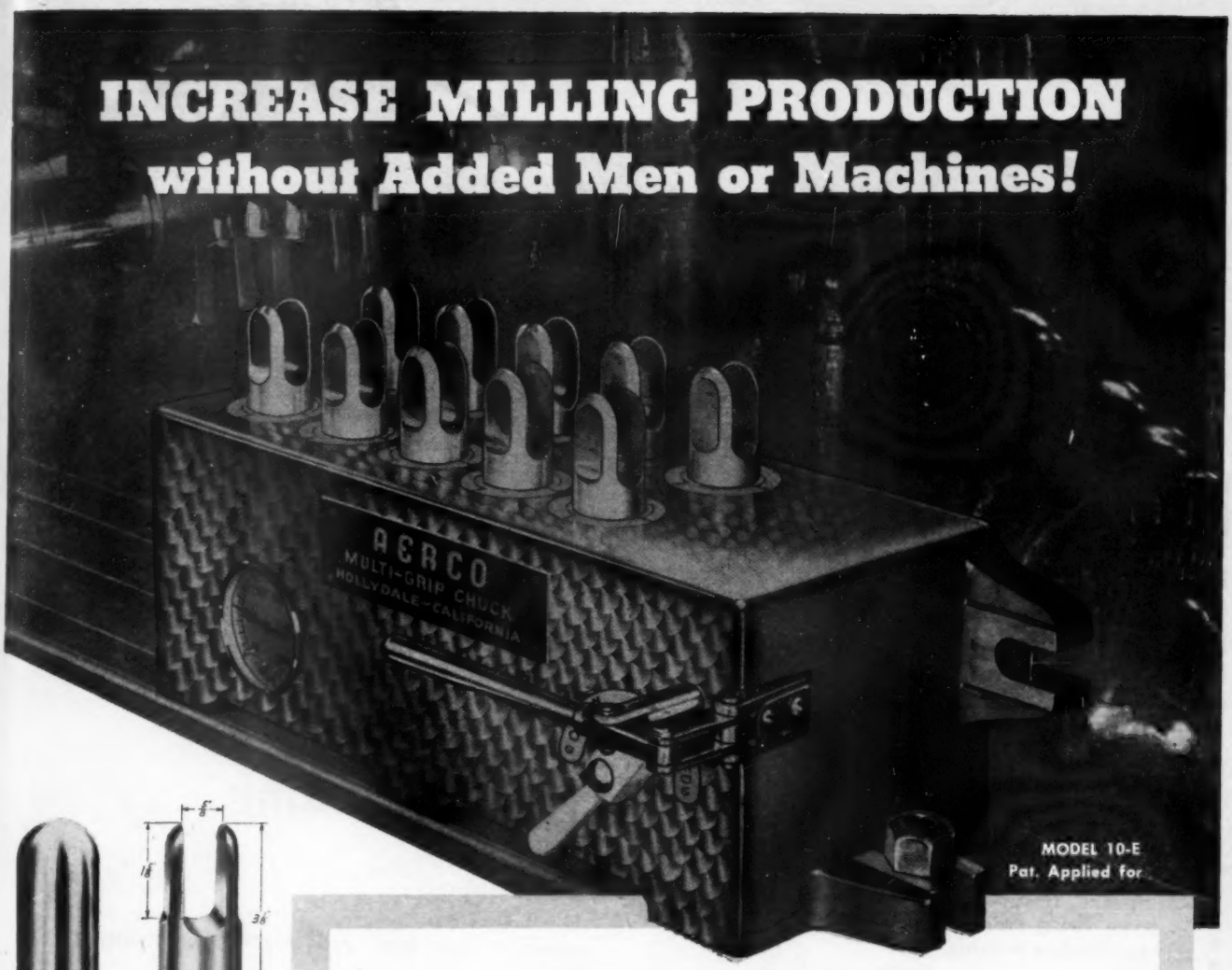
● Do you use radius forming diamond tools in your shop? If so, you'll want a copy of this new book—just off the press. It illustrates and describes the complete line of radius forming diamond tools designed and manufactured by Wheel Trueing Tool Company . . . the most complete line on the market today. And it explains why these tools that are engineered to the job produce such accurate work, give such dependable performance, speed production and provide such money-saving economy. It is a book you should read . . . and will want to keep for future reference.

We have a copy of this new book waiting for your request. Write today.

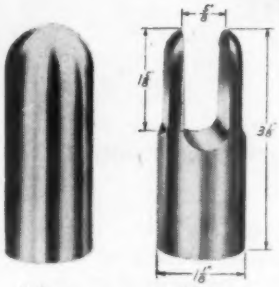
WHEEL TRUEING TOOL COMPANY

3200 W. Davison Ave. Detroit 6, Michigan

INCREASE MILLING PRODUCTION without Added Men or Machines!



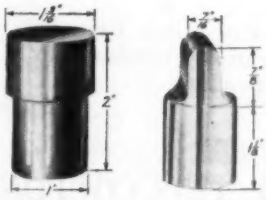
MODEL 10-E
Pat. Applied for



Before After

Aluminum Parts

These aluminum parts were milled upon the Aerco Multi-Grip Chuck at the rate of 355 per hour (floor to floor) as compared with single milling operations of only 71 per hour.



Before After

Chrome Steel Parts

These parts, high heat treated of Chrome-moly, were produced at the rate of 62 per hour (floor to floor) on the Aerco Multi-Grip Chuck. Individual milling time was 15 per hour.

These parts milled with the use of the Aerco Multi-Grip Chuck show its versatility.

with the AERCO HYDRAULIC MULTI-GRIP CHUCK

Two rows of collets hold ten parts and both rows are milled simultaneously and with but a single loading increasing production as much as 500%.

Self-centering aligning collets insure perfect on-center milling regardless of slight shank diameter variations. Safety stop prevents damage to collets should all stations not be loaded.

Aerco Multi-Grip chucks may be used for both vertical and horizontal milling. Work is held rigidly in collets and cannot turn or be pulled out during milling operation, however clamping pressure is instantly releasable and self-opening collets can be quickly re-loaded.

Collet sizes range from ⅛" to 1¼" and are available in round, square or hexagon shapes.

Representatives Wanted in Principal Cities

MANUFACTURED EXCLUSIVELY BY

AERCO CORP.

HOLLYDALE, CALIFORNIA

ARMY E NAVY

WRITE FOR NEW FOLDER

and Better

Something NEW Has Been Added!

METALITE CLOTH BELTS

Improve Swing Frame Grinding

Special, heavy-duty Metalite Cloth Belts on new type swing frame grinders are making amazing production records.

On many heavy metal grinding and snagging operations these fast, cool cutting abrasive belts with smooth running "Uniflow" joint, do a better job in less time at lower cost than solid or set up wheels on swing frame grinders.

Remove More Stock

Heavy-duty Metalite Cloth Belts are out-producing snagging wheels at rates of 4 and 5 to 1 in amount of stock removed.

Cut Faster

Stock removal is done more rapidly with grinding time reduced as much as 60%.

Cut Cooler

The larger cutting area of Metalite Cloth Belts generates less heat and assures faster dispersion.

Finish Better

These fast, cool cutting abrasive belts give far better finish than could possibly be secured from the rigid face of a coarse, solid snagging wheel.

Increase Production

More metal removed in shorter time gives desirable cumulative increase in hourly production.

Reduce Costs

All these advantages of Metalite Cloth Belts in swing frame grinding operations combine to lower costs and give a better product.

BEHR-MANNING
(DIVISION OF NORTON COMPANY)
TROY, N. Y.

Be Sure to INVESTIGATE . . .
MAIL THIS COUPON

Please send folder on *NEW* Swing Frame Grinding Methods

Firm Name .....

Street Address .....

City ..... State .....

by ..... Title .....

"This is a Grinding War . . ."

Copyright 1892 and 1920 by Harper & Bros.

MORTAR'S GRANDPA

You could pick up this U. S. mortar about as easily as you could move a safe and it was about as easy to move around. But its advocates back in the nineties foresaw the importance of such armament in modern warfare.

Today's version can be carried at a brisk trot by a couple of men. It can go into action in seconds. It's a precision weapon —precision built, facts that many a Nazi and Jap have discovered with a jolt.

Where did a lot of the modern mortar's precision come from? From a little iron-bowl furnace in which over 52 years ago, Dr. Edward Goodrich Acheson created the first man-made abrasive. Since then abrasive products have become one of our most important production tools in the skilled hands of American industry.

Abrasive wheels are used to grind the parts of mortars, plane and tank engines, giant guns and other war weapons to unbelievable accuracy.

This accuracy is responsible not only for the efficient performance of these weapons—it also makes their mass production possible.

For mass production depends on interchangeability of parts. And interchangeability depends on split-hair precision.

Today it is almost impossible to put your finger on a single article mass produced for war or for peace that isn't in some way touched by grinding. On the land, in the air, on and under the sea, material produced by abrasive manufacturing methods are blasting the path to victory for the United Nations.

We at Carborundum are mindful that "this is a grinding war." Our efforts and resources are pledged to making it as short as possible.

* * *

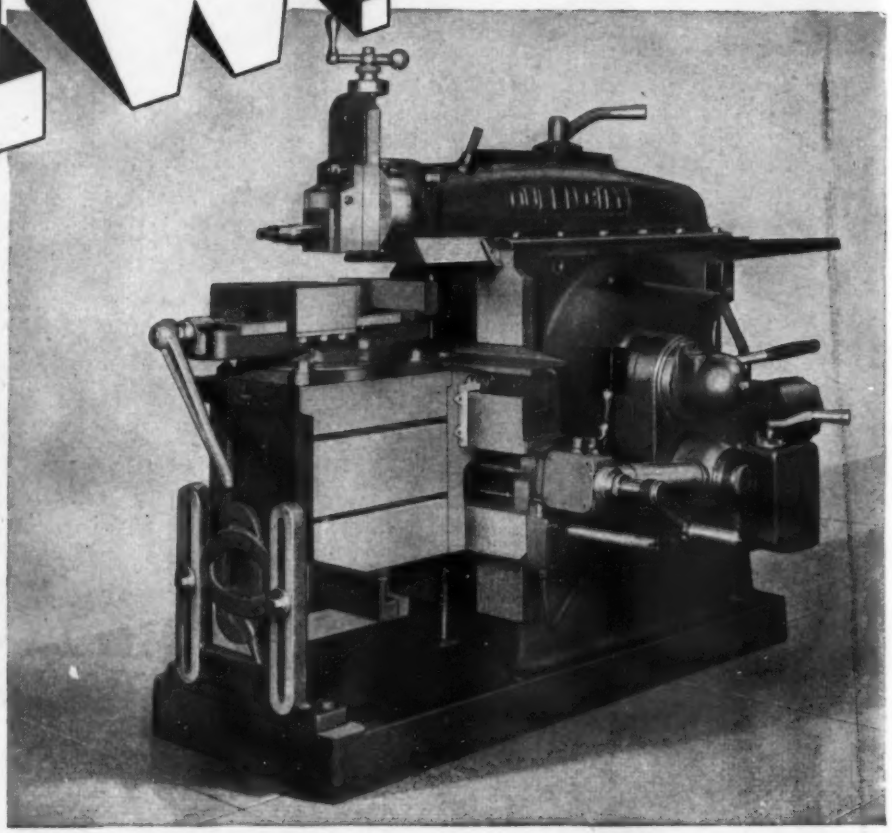
Every hour this war is shortened will save $12,000,000. The lives it will save are priceless. So please remember that grinding wheels, too, are "Weapons for Production"... use them wisely to help end the war sooner.

The Carborundum Company, Niagara Falls, New York.

THE CARBORUNDUM COMPANY

CARBORUNDUM AND ALOXITE ARE REGISTERED TRADE-MARKS OF AND INDICATE MANUFACTURE BY THE CARBORUNDUM COMPANY

NEW!



The 20"
QUEEN CITY
Super Twenty Shaper

...The very latest in Shaper Design and Efficiency!

This new Queen City Shaper is a heavy, rugged machine affording greater ease and convenience of operation, equally suited for both the daily grind of heavy production and general tool room work.

The ram is of the V-type of wide bearing, both bottom and sides. The clutch is the dry multiple-disc type, requiring minimum attention and adjustment. The feed range is extremely versatile—from .008" to .191". Changes of feed are quickly, easily accomplished. A high torque motor for the power rapid traverse is standard equipment, with many unusual features. An electrical limit switch is incorporated into the rail, offering complete motor control. Timken Bearings are used throughout.
For top performance, speed, versatility, accurate workmanship, and unusual economy both in first cost and upkeep, the Queen City "SUPER TWENTY" Shaper will meet with your entire satisfaction.

For full details regarding features and specifications of this new Shaper, write Dept. AM.

Agents in principal cities.

QUEEN CITY
MACHINE TOOL Co.
217 E. SECOND ST.
CINCINNATI 2, OHIO

Proved in Naval Service

For all Types of Heavy Duty Drives

The Fawick Airflex Principle consists of a rubber and cord gland, which expands against the driven rim, under controlled air pressure. No arms, levers or toggles—no adjustments to make—no lubrication required. Shocks and vibration absorbed by a cushion of air.

A hundred new Diesel-powered tugboats are now being built by U. S. Army Engineers—each equipped with the Fawick Airflex Clutch.

Already several thousands of these remarkable clutches are in service in Navy vessels of many types—giving these ships a degree of maneuverability never known before.

Proved in this exacting service, under the most extreme conditions, the Fawick Airflex Clutch is fast becoming standard equipment for all kinds of heavy duty drives—on paper and rubber mills, heavy presses, hoists, cranes and draglines, oilfield drilling rigs—wherever the going is tough.

Let us tell you about the Fawick Airflex Clutch for *your* drives. Booklet on request.

FAWICK AIRFLEX COMPANY, INC.
9919 Clinton Rd. Cleveland 11, Ohio
In Britain, Crofts Engineers, Ltd., Bradford, England

FAWICK *Airflex* CLUTCH

POWER CONTROLLED BY AIR

These Versatile TOOL STEELS... with original prewar analyses... are again available for your tool and die jobs

For many months, Bethlehem has been unable to supply certain standard brands of tool steel for general distribution. *But this is no longer true of eight very popular grades—eight types that will handle 97 per cent of your jobs requiring tool steel.*

And here's more news: These highly-versatile tool steels are back *on prewar compositions;* they are not substitute analyses. For this reason, they can be relied upon to do the same dependable job that they were doing in thousands of shops before war-time shortages.

The Big 8 Bethlehem Tool Steels, once more available to shop men generally, are as follows:

- **CARBON TOOL STEEL**
- **TOOL ROOM**
- **OMEGA**
- **NO. 67 CHISEL**
- **AIR-HARDENING**
- **LEHIGH DIE AND TOOL, H TEMPER**
- **NO. 57 HOT WORK**
- **NO. 66 HIGH SPEED**

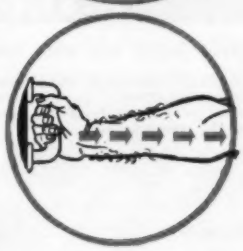
If these eight steels are old friends of yours, you can now get acquainted with them all over again. If you haven't used them before, why not let us tell you about their applications and advantages?

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

Bethlehem Steel Export Corporation
New York City

★ BETHLEHEM STEEL ★

FOR POWER MOVEMENT IN ANY DIRECTION



When T-J Air or Hydraulic Cylinders "take over" a job of power movement...experienced shop men know these Cylinders will deliver top efficiency in every stroke!

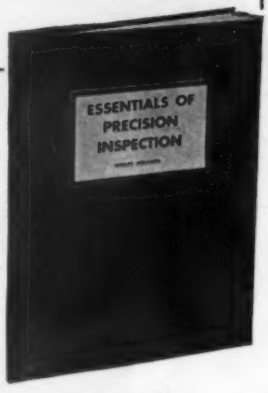
Whether it's a mechanical movement requiring pressure to clamp...press...raise ...or shift—T-J Cylinders do the job *right!* Designed for compactness, these Cylinders are accurately machined for correct mounting and highly efficient performance. Cylinder bores are honed to accurate concentricity, then hard chrome plated. Available in many standard sizes and styles...both cushioned and non-cushioned types. T-J engineering and skilled workmanship assure utmost dependability. Send for latest catalogs. The Tomkins-Johnson Co., Jackson, Mich.

FOR TOUGH JOBS SPECIFY T-J

TOMKINS-JOHNSON

RIVITORS...AIR AND HYDRAULIC CYLINDERS...CUTTERS...CLINCHORS

Know the answers to your PRECISION INSPECTION problems



Here, to help you answer those perplexing questions about precision inspection, is important, timely information covering inspection from many angles. This practical work manual helps the mechanic at the bench and machine as well as those who inspect and pass on his work. It lays a foundation on which even an inexperienced person can develop skill in using and adjusting precision tools and instruments.

JUST PUBLISHED

ESSENTIALS OF PRECISION INSPECTION

By WESLEY MOLLARD

Journeyman Toolmaker; Instructor, Machine Shop, George Junior Trade School, Detroit

8½ x 11, 207 pages, 243 illustrations, 40 blueprints, $3.00

This book, written for the author's National Defense classes in Detroit, presents easily understood and well-illustrated information on types and uses of inspection instruments, methods of use, how to check them etc. Have at your fingertips the use of the V block, the cutter-clearance gage, the depth micrometer, the vernier caliper, the adjustable parallel, the optical comparator and many other instruments discussed in detail in this book. The material is so arranged that the reader gradually goes from the elementary to the advanced problems meanwhile acquiring skill in reading and in using the different precision tools. Inspectors will find many pointers leading to special advanced precision inspection.

CONTENTS:

1. Inspection Tools and Gages
2. Rules
3. Micrometer Calipers
4. Vernier Gages
5. Checking Holes
6. Knurling - Curburizing - Sandblasting
7. Gage Blocks and Attachments
8. Sine Bar
9. Milling Cutters-Key Slots
10. Threads
11. Problems
12. Gears

Some vital points covered:

- how to set a sine bar
- how to check an angle with the sine bar
- how to adjust an inaccurate micrometer
- how to hold a micrometer caliper correctly
- the seven factors in checking a hole
- how to read a vernier gage
- how to transfer a measurement from a caliper to a micrometer
- the three grades of gage blocks
- how to acquire the "feel" when measuring with gages
- the importance of temperatures

ASK TO SEE IT 10 DAYS FREE

McGRAW-HILL ON-APPROVAL COUPON

McGRAW-HILL BOOK CO., INC., 330 W. 42nd St., New York 18

Send me Mollard-Essentials of Precision Inspection for 10 days' examination on approval. In 10 days I will send $3.00 plus few cents postage, or return book postpaid. (Postage paid on orders accompanied by remittance.)

Name .....

Address .....

City and State .....

Position .....

Company .....A—2-2-44

(Books sent on approval in U.S. and Canada only.)

SOONER OR LATER, THEY ALL FALL!

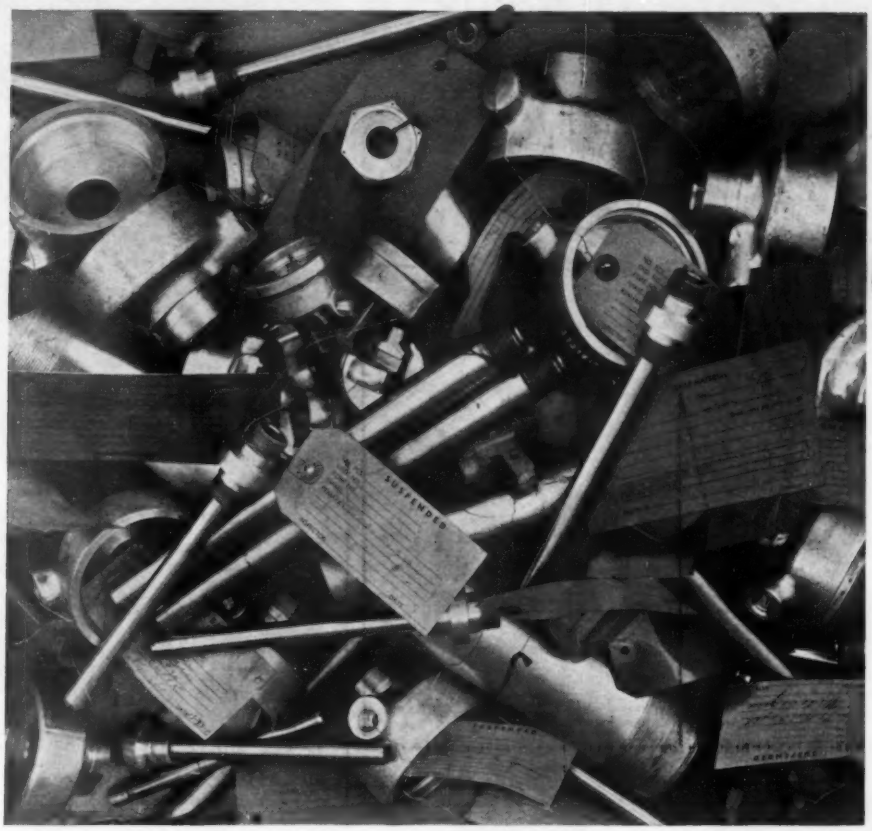
Unless Your Oily Floors Are Protected with *SPEEDI-DRI*

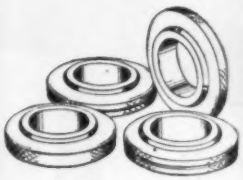
To the man responsible for your production and to the man whose job it is to keep insurance costs down, slipping and falling accidents present a serious problem — but one that is, fortunately, easily solved by SPEEDI-DRI — a white, granular substance that provides an immediate, non-skid surface on the oiliest, greasiest floor. SPEEDI-DRI soaks up oil and grease like a blotter absorbs ink, drawing *all* the oil (even old stains) right out of wood, steel, or concrete. At the same time, it retards fire because it won't burn even when oil-soaked; brightens up the plant; saves vital manpower needed for more productive jobs than cleaning; speeds production by making workers sure-footed. Write for literature and FREE SAMPLE.

SUPPLIERS: East — Refiners Lubricating Co., New York 1, New York.
Midwest & South — Waverly Petroleum Products Co., Philadelphia 6, Pa.
West — Waverly Petroleum Products Co., Russ Bldg., San Francisco 4, Calif.

SPEEDI-DRI
OIL AND GREASE ABSORBENT

IT'S "NO GO!"





And Countless Lives are Saved

Because inspectors stand on guard in America's war plants, ready to say "NO GO" after gauging each vital part, countless lives of our fighting men are saved. In the heat of battle our tanks, planes, ships and machines must perform. America is proud of the skill and precision that goes into every assembled part. Judging that precision—in the hands of inspectors—is the important role of Kobe gages. It is on the most minute accuracy of these gages that ultimate Victory depends. Kobe gage quality did not come into being overnight. It is the product of years of research . . . of the sweat of skilled workmen . . . of careful selection of materials . . . of the latest precision equipment and finest manufacturing facilities. THESE are the ingredients which today make Kobe gages synonymous with *quality*. With its gage division now greatly expanded and entirely mobilized for war, Kobe is constantly testing, re-testing, working for improvement. Out of this development, born of wartime demands, will come new standards of perfection, newer, finer tools which in peacetime will once again be available. Right now, Kobe gages have a big job to do. And they are doing it—RIGHT—on hundreds of vital manufacturing jobs. Kobe gage quality and the inspector's "GO" and "NO GO" combine to make American equipment the finest in the world today. So, today, Kobe's gages are helping to win the war. Tomorrow they will be available to help build the products of peace. But always, the goal of Kobe is *quality*.

KOBE

Master and Reference GAGES

KOBE, INCORPORATED
3040 East Slauson Avenue • Huntington Park, California

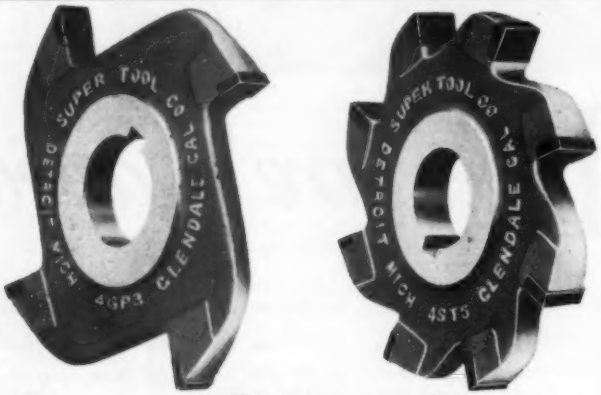
Look at these NEW 25% LOWER PRICES ON SUPER Milling Cutters!

For Milling Cast Iron, Non-Ferrous and Other Materials

Tool No.	Dia. "A"	Width "B"	Hole "C"	No. of Teeth	Price
3-GP-1	3"	¼"	1"	4	$12.00
3-GP-2	3"	⅜"	1"	4	12.50
3-GP-3	3"	½"	1"	4	10.00
3-GP-4	3"	⅝"	1"	4	11.00
3-GP-5	3"	¾"	1"	4	12.00
4-GP-1	4"	¼"	1"	4	13.00
4-GP-2	4"	⅜"	1"	4	13.50
4-GP-3	4"	½"	1" or 1¼"	4	12.50
4-GP-4	4"	⅝"	1"	4	13.50
4-GP-5	4"	¾"	1" or 1¼"	4	14.25
4-GP-6	4"	⅞"	1"	4	15.00
4-GP-7	4"	¾"	1" or 1¼"	4	16.00
4-GP-8	4"	¾"	1" or 1¼"	4	17.00
5-GP-4	5"	⅝"	1¼"	6	17.50
5-GP-5	5"	¾"	1" or 1¼"	6	17.75
5-GP-6	5"	⅞"	1¼"	6	18.50
5-GP-7	5"	⅞"	1¼"	6	18.75
5-GP-8	5"	¾"	1" or 1¼"	6	20.50
6-GP-8	6"	¾"	1" or 1¼"	6	21.75
6-GP-7	6"	⅞"	1¼"	6	24.00
6-GP-8	6"	⅞"	1" or 1¼"	6	27.00
6-GP-10	6"	1"	1¼"	6	37.00
8-GP-8	8"	⅞"	1¼" or 1½"	8	40.00

For Milling Steel

Tool No.	Dia. "A"	Width "B"	Hole "C"	No. of Teeth	Price
3-ST-1	3"	¼"	1"	6	$14.00
3-ST-2	3"	⅜"	1"	6	14.25
3-ST-3	3"	½"	1"	6	14.75
3-ST-4	3"	⅝"	1"	6	15.50
3-ST-5	3"	¾"	1"	6	16.25
4-ST-1	4"	¼"	1"	8	17.00
4-ST-2	4"	⅜"	1"	8	17.75
4-ST-3	4"	½"	1" or 1¼"	8	18.25
4-ST-4	4"	⅝"	1"	8	18.75
4-ST-5	4"	¾"	1" or 1¼"	8	19.50
4-ST-6	4"	⅞"	1"	8	20.75
4-ST-7	4"	⅞"	1" or 1¼"	8	22.50
4-ST-8	4"	¾"	1" or 1¼"	8	24.50
5-ST-4	5"	⅝"	1¼"	10	25.25
5-ST-5	5"	¾"	1" or 1¼"	10	26.25
5-ST-6	5"	⅞"	1¼"	10	27.50
5-ST-7	5"	⅞"	1¼"	10	28.25
5-ST-8	5"	¾"	1" or 1¼"	10	30.00
6-ST-5	6"	¾"	1" or 1¼"	12	33.75
6-ST-7	6"	⅞"	1¼"	12	35.00
6-ST-8	6"	¾"	1" or 1¼"	12	40.00
8-ST-8	8"	¾"	1¼" or 1½"	12	48.00



• and Remember . . .

Low first cost is only one of the many economies you'll enjoy when you use Super Carboloy Tipped Milling Cutters. Other money-saving features include: faster milling, greater accuracy because of less work distortion, finer finishes, and more work because of less machine down time. Try Super Carboloy Tipped Milling Cutters and you, too, will agree . . . they are MONEY SAVERS!

SUPER TOOL CO.

21650 Hoover Road, Detroit 13, Mich. ★ 4105 San Fernando Rd., Glendale 4, California

Carbide Tipped Tools

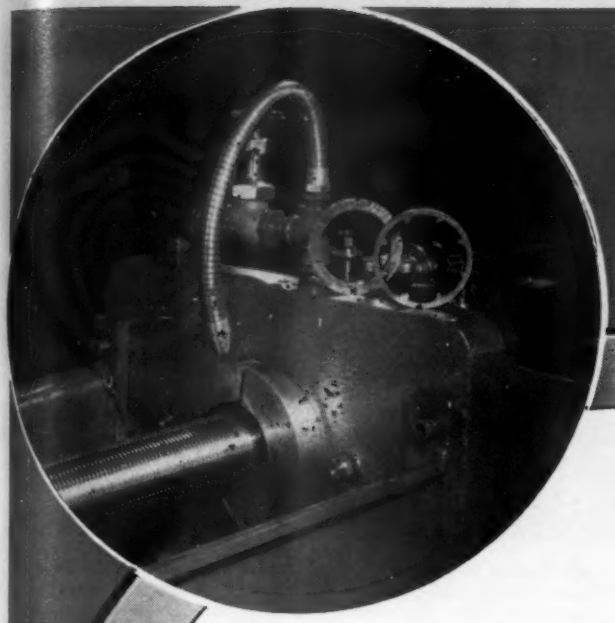
WHEN IT'S *Versatility* YOU WANT!

● Grinding — Sanding — Rotary filing — Polishing — Wire brushing — Drilling — many other operations—all done with one Haskins Flexible Shaft Machine. And done better, too—and faster. This is no single operation machine. In every metal working plant, machine shop, foundry and die shop, there's no end of jobs for Haskins Equipment. Get the most from *your* man-hours. Write for Catalog 45, showing many ways to speed production with flexible shaft equipment. R. G. Haskins Company, 2760 W. Flournoy Ave., Chicago, Ill.

HC-5

½ H. P.—Multi-speed countershaft unit, 900 to 3200 R. P. M. Mounted bench-height on 3-leg caster base, 360° swivel.

HASKINS
Flexible Shaft
EQUIPMENT
More VERSATILE Machines for More PROFITABLE Work



8 at a time

Today Lapointe broaches and broaching machines are producing more precision parts than previous methods of machining. Typical of these production installations are the .4L Broaching Machines at the Springfield Arsenal that are making the apertures for Garand rifles. Shown on the face plate of the machine above is the ring before and after spline broaching. This ring is made from a forging ground to correct thickness. It is then spline broached and each finished ring makes 8 parts. This 8-at-a-time production accounts for 2,240 component parts per hour in one single high speed operation.

ARMY E NAVY

The LAPOINTE Machine Tool Company

HUDSON, MASSACHUSETTS, U. S. A.

Photo courtesy of Lucas Screw Products, Inc.

Tapping is easy

ON THE *Ettco-Emrick*

FOOT-OPERATED

TAPPING MACHINE

It's no trick at all for girls to do fast, accurate tapping on this machine—and keep it up all day with very little fatigue. Here's why. (1) The operator has only to feed the work and step on the pedal: (2) The skill ordinarily needed is supplied by the Ettco-Emrick Tapping Head; (3) Both hands are free for work handling; (4) The whole mechanism is so sensitively counter-balanced, the pedal works as easy as the accelerator on a car. Yes, inexperienced operators—girls or men—can give you a steady production of 2400 accurately tapped holes per hour with the standard 2-spindle head, and up to 12,000 per hour with available Ettco-Emrick Multiple Spindle Heads.

BULLETIN No. 4

will give you full details of this "almost human" machine. Copy mailed to you on request.

ETTCO TOOL CO.

590 Johnson Ave., Brooklyn 6, N. Y.

Detroit ● Chicago

25 YEARS SPECIALIZATION IN TAPPING EQUIPMENT

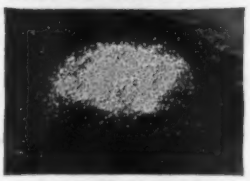
FIRE-SAFE FLOORS

Fidelity ABSORBO
OIL AND GREASE ABSORBENT AND FLOOR CLEANER

Absorbo has been approved as a Class 1 non-combustible by Underwriters' Laboratories. This dry compound eliminates the hazard of the highly flammable sawdust ordinarily used for soaking up oil spills. Even when thoroughly oil-soaked Absorbo resists burning.

EASILY APPLIED

Simply sprinkle Absorbo on the oil-soaked area or on floors where oil spills are likely to occur. The amount may be varied to suit conditions.



ABSORBENT

It soaks up oil and grease accumulations up to 45% to 50% of its weight almost immediately, and affords a clean, dry surface.

FOOTSURE

Safe traction is provided both for walking and for vehicles, such as hand trucks. Thus accidents due to slipping and skidding are avoided.

NON-ABRASIVE

Because of the soft, sponge-like quality of the granules, Absorbo will not mar machine parts or surfaces. It may be used freely on all types of floors without fear of abrasive action.

SWEEPS CLEAN!

Absorbo may be swept up immediately after application — or allowed to remain until thoroughly saturated, in the case of recurring oil spills. In both instances, a clean dry floor surface will result.

Send for trial 50-lb. bag at $2.75 F.O.B. Newark, with unconditional money-back guarantee if not satisfactory. Substantially reduced prices on quantity orders.

(Territories are open for local distributors. Write for details.)

FIDELITY CHEMICAL PRODUCTS CORP.

DEPT. D6, 430 RIVERSIDE AVE.

NEWARK 4, NEW JERSEY

Cutting a coil form on a Walker-Turner Radial Saw; equipped with a special attachment for rotating the workpiece.

One of several groups of Walker-Turner Drill Presses in the General Ceramics plant. These machines are used in drilling and tapping insulators of all types.

WHEN YOU USE
WALKER-TURNER MACHINE TOOLS

At General Ceramics and Steatite Corporation's plant, Walker-Turner Machine Tools are used on a variety of jobs — in machining the Steatite insulators which this Company manufactures for the High Frequency Communication Equipment used by our Armed Forces.

Walker-Turner Machine Tools' *wide range of speeds* enables General Ceramics to select the optimum speed for their particular work. Their *accuracy* and *spindle stability* are important because Steatite is machined in its green, fragile condition before firing. And their *simplified design* and *easy operation* help this Company's many women workers turn out a greater volume of high-quality work.

In thousands of other war plants, also, Walker-Turner Machine Tools are doing a notable job in getting production "over the hump". Perhaps they are the answer to some of your machining problems, too. Send for catalog.

WALKER-TURNER COMPANY, INC.
4534 Berckman St., Plainfield, N. J.

walker-Turner
COMPANY, INC.
PLAINFIELD, N.J.
U.S.A.

MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

CARD
MACHINE SCREW
TAPS
CARBON AND HIGH SPEED STEEL

The CARD Quality

PROVE THEIR PERFORMANCE ON YOUR WORK

CARD MACHINE SCREW TAPS are furnished with American National form of thread and standard number of flutes in taper, plug or bottoming style.

Regular Type manufactured in 2, 3 or 4 flutes depending on size—in taper plug or bottoming styles.

Spiral Pointed furnished in 2 flutes—in plug style only.

All Types available in Carbon, High Speed cut and High Speed Ground Thread.

The long life and economy of Card Machine Screw Taps are quickly proved in every day use. Buy them, put them to work and you'll be convinced of their better performance.

Consult the Card Catalog for sizes. Send for your copy as well as for literature covering recommended uses.

LEADING DEALERS HANDLE CARD TAPS

S. W. CARD MANUFACTURING CO.
Mansfield, Mass., U. S. A.
DIVISION OF UNION TWIST DRILL CO.
STORES: New York, 61 Reade St., Chicago: 11 S. Clinton St., Detroit: 6540 Antoine St., San Francisco: 121 Second St., Seattle: 568 First Avenue, South Los Angeles: 524 East Fourth Street

NATIONAL KEYSEATING MILLER

. . . the tool that converts drilling machines into key-seaters and saves time and money

• With this modern tool you can handle keyseating jobs not suitable for keyseating machines on any of your drill presses or radials. Keyseats with parallel sides, accurate in depth and in perfect alignment with bore axis are assured.

The National Keyseating Miller mills, keyseats in one cut. It can be used on taper holes, offset holes, blind holes and for taper keys. Work clamping is unnecessary. We also manufacture oil-grooving millers.

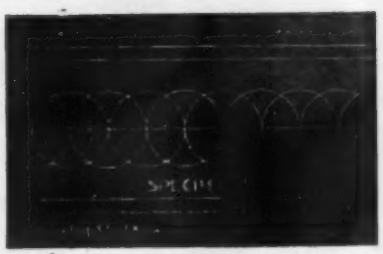
Made in twenty-six different diameters from ½" to 3½". Several widths of cutters can be used in each size.

WRITE TODAY FOR OUR NEW CATALOG NO. 15

NATIONAL MACHINE TOOL CO.
CINCINNATI, OHIO

DYKEM STEEL BLUE

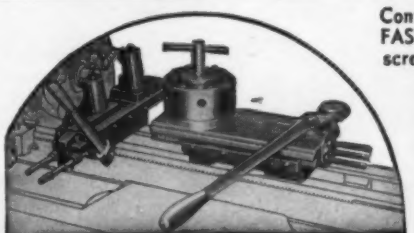
STOPS LOSSES
making dies & templates



simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information

THE DYKEM COMPANY, 2301 B N 11th St., St. Louis, Mo.
In Canada: 444 Pacific Ave., Toronto, Ont.



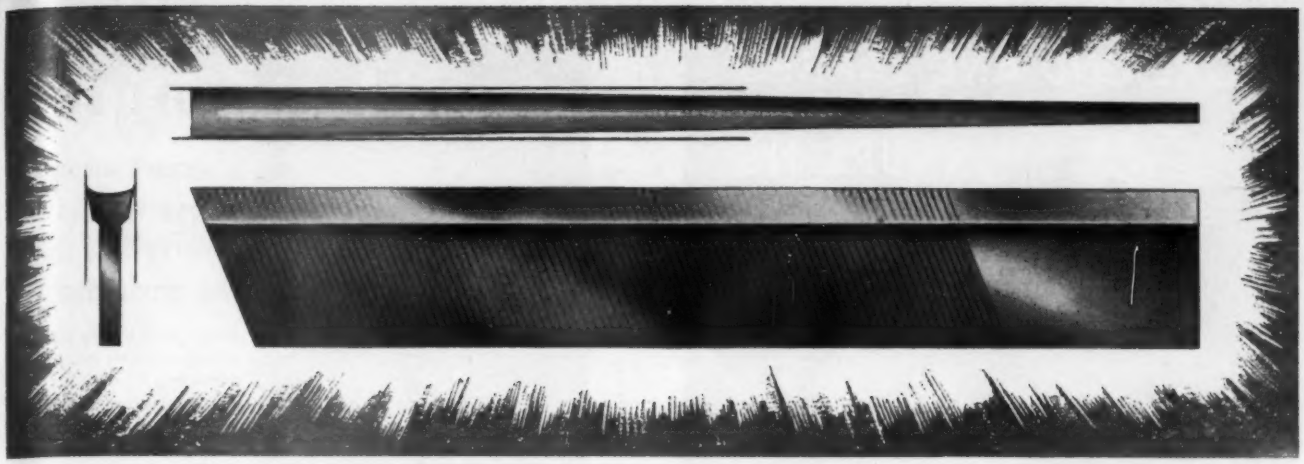
LYNN HEAVY DUTY, Self-Indexing **BED TURRET** and CUT-OFF CROSS SLIDE

Convert your lathes for FAST, precision hand screw work with sturdy, finely constructed Lynn units. Lynn Model BT-1 (shown at left) fits standard small and bench lathes up to 13" swing. Model BT-3, for standard engine lathes up to 24" swing. Also cut-off Cross slides, and LYNN Tool Post Turrets for lathes from 12" to 28" swing.

Built to PRECISION Standards

Prompt Shipments. Write for full details

LYNN MFG. CO., 224 Elroy St., Minneapolis 8, Minn.



THIS CUTTING-OFF BLADE IS PRODUCTIVE TO WITHIN 1" OF ITS LENGTH

It never loses its back clearance

It is tapered along its longitudinal cutting width

It never loses its side clearance

It is T-shaped its full length

It never creates excessive friction

Besides its T-shape and taper (mentioned above), its hollow-ground top contributes much to the elimination of excessive friction. The latter causes chip to collapse and relieve pressure against sidewalls of cut

It never requires resharpening anywhere except on front face

It never needs grinding of rake

It never causes down time

Whenever blade is taken out of holder for resharpening, it can be replaced without disturbing original setup. Great time-saving feature

We carry parallel blades which incorporate all features of the blades described above, minus the taper on the longitudinal cutting width. Either type shipped immediately

We are also manufacturers of Empire Floating Tool Holders and distributors of Fastcut Products

Send for Complete Catalog

BUY WAR BONDS

EMPIRE TOOL COMPANY MANUFACTURES LUERS PATENTED CUTTING-OFF BLADES AND HOLDERS UNDER LICENSE ISSUED BY JOHN MILTON LUERS PATENTS, INC

The Blades That Reduce Friction

EMPIRE Tool Co.

8778 Grinnell Ave. Detroit 13, Mich.

GROUND AND LAPPED FOR PRECISION KNURLING

REED KNURLS

More than 100 Different Styles and Sizes IN STOCK for Prompt Delivery. All Standard knurls now available in either CARBON Steel or HIGH SPEED Steel.

Special Knurls made to your specifications

New Catalog 62 Sent Upon Request.

REED SMALL TOOL WORKS
WORCESTER 2, MASSACHUSETTS

for midget magic

...expert mechanics choose these small tools to help speed war production . . .

Midget Plomb tools work like magic on small precise jobs because:

1. They are designed to give maximum service in minimum space—work better.
2. They are strong and accurate — safer to use.
3. They are built to highest quality standards — last longer.

You'll find these things true of all other hand tools in the complete Plomb line — famous in all industries for better, safer, longer-lasting service. Call the friendly Plomb dealer near you to get the Plomb tools you need for your war job.

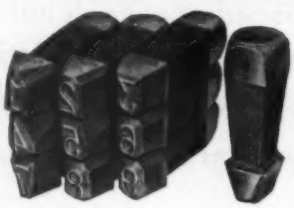
PLOMB

PLOMB TOOL COMPANY
LOS ANGELES, CALIF.

SAFETY Wedge Grip LETTERS AND FIGURES
(Reg. Trade Mark)

FOR TOUGH STAMPING JOBS!

- Deeper impression with less exertion.
- Will not spall, will not mushroom
- Any size character from 1/16" to 1"



M.E. CUNNINGHAM CO.
SAFETY STEEL STAMPS
95 E. Carson St., Pittsburgh, Pa.

25% to 50% MORE SERVICE

"ROCKWELL" HARDNESS TESTER

These new improved type testers available from stock.

Made Only By

WILSON
MECHANICAL INSTRUMENT CO. INC.
Concord Ave., New York 54

PROVEN CUTTING FLUIDS

PROPER APPLICATION

Stuart's Thred Kut SOLVOL "SUPER-KOOL" CODOL

This combination will help you solve difficult metal-working problems

For All Cutting Fluid Problems

D. A. STUART OIL CO. LIMITED
Chicago, U. S. A. Est. 1865

Warehouses in Principal Metal Working Centers

VETERAN!

Unretouched photo of a National milling cutter after long and hard service. Because of regular resharpening this cutter lasted far beyond its normal life expectancy.

Hours can be added to the useful life of cutting tools by a policy of regular resharpening. Sharp tools last longer, produce more and better work.

NATIONAL

NATIONAL TWIST DRILL & TOOL © DETROIT U.S.A.

TWIST DRILLS
REAMERS, HOBS
MILLING CUTTERS
COUNTERBORES
SPECIAL TOOLS

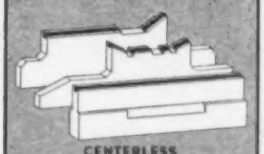
TWIST DRILL AND TOOL COMPANY

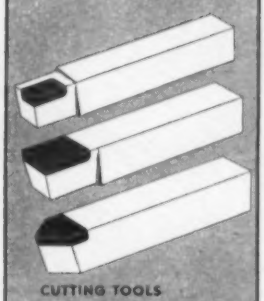
HOME OFFICE AND FACTORY—DETROIT, MICH.

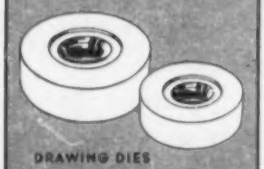
Tap and Die Division—Winter Brothers Co., Wrentham, Mass.

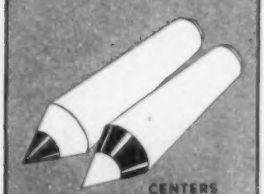
Factory Branches • New York • Chicago • Cleveland • San Francisco • Distributors in Principal Cities

TALIDE-TIPPED *for Production!*









TALIDE METAL

. . . is a superior grade of Tungsten Carbide—developed by us during the past twelve years and manufactured today by precision methods under rigid control. It has exceptional density, strength and hardness and is ideal for application at wear points on tools, machinery and equipment. Talide Metal bar stock is available in any size, diameter and length.

The use of Talide Metal in your plant will assure you of constant, uninterrupted production with the added advantages of . . .

★ Longer Life
★ Increased Output
★ Maintained Size
★ Closer Tolerance
★ Fewer Rejects

Thousands of Talide-Tipped Tools, Dies and Wear Resistant Parts are shipped daily all over the country to Arsenals and War Plants producing cartridge cases, small arms ammunition, primer cups, airplanes, tanks, ships, rifles, machine guns and other war material.

TIPPED WITH TALIDE TUNGSTEN CARBIDE

METAL CARBIDES CORPORATION
YOUNGSTOWN, 5 OHIO
TUNGSTEN CARBIDE TOOLS · DIES · WEAR PARTS

Almond Drill Chuck

The Pioneer

Almond Three-Jaw Drill Chucks were Pioneers in their field — the first to be placed on the market. They have formed a necessary part in the logical procedure of machine developments over the past seventy and more years.

Almond Drill Chucks are made in types and sizes to fit all machine tools and portable drills.

Write for complete details.

T. R. ALMOND MFG. CO.
ASHBURNHAM, MASS., U. S. A.

The Original Manufacturers of Drill Chucks

HARDNESS TESTER

Let the SCLEROSCOPE speed up the production of that s so we can blow the Axis to HELL

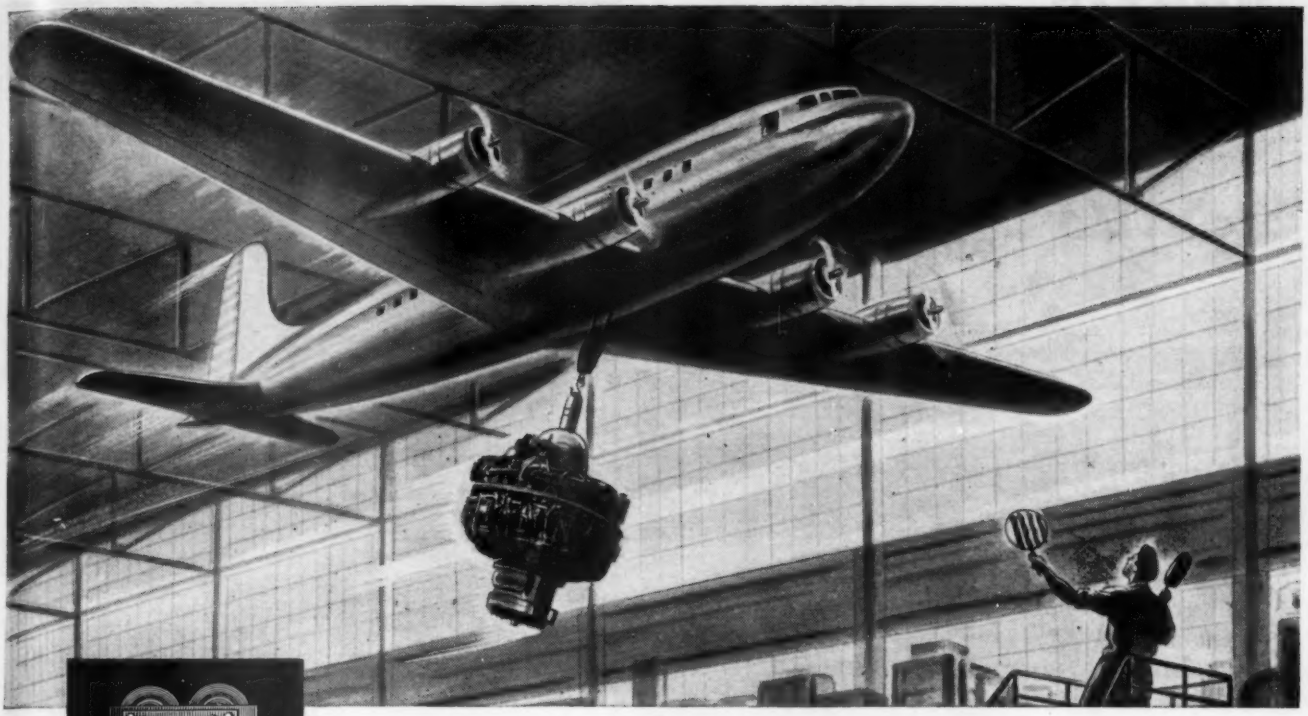
Write for Circular!

THE SHORE INSTRUMENT & MANUFACTURING CO., INC.
9025 VAN WYCK AVENUE
JAMAICA, NEW YORK
TELEPHONE: JAMAICA 6-4090

"Safety First"...

in putting belts on moving pulleys. This belt stick attachment prevents accidents caused by throwing belts on and off moving pulleys. Avoid accidents rather than pay for them. Two sizes to cover belts from 1" to 4".

THE READY TOOL COMPANY
IRANISTAN & R. R. AVES., BRIDGEPORT, CONN.



Wright

cranes and hoists are your cargo planes . . .

● Up under factory ceilings, **WRIGHT** cargo carriers move materials fast, safely and economically —vertically or horizontally. No "ceiling zero" with efficient **WRIGHT** Improved High Speed Hoists, **WRIGHT** *Speedway* Electric Hoists or **WRIGHT** Cranes. Instead, ceiling areas are used to one hundred per cent production advantage.

The **WRIGHT** way is tailor-made to meet your problems—and to save you money. Consult your local **WRIGHT** distributor, who is well qualified to suggest improved material-handling methods for your plant. You will find him listed under "**HOISTS**" in your metropolitan classified telephone directory.

WRIGHT MANUFACTURING DIVISION
York, Pa., Chicago, Denver, Los Angeles, San Francisco, Portland, New York

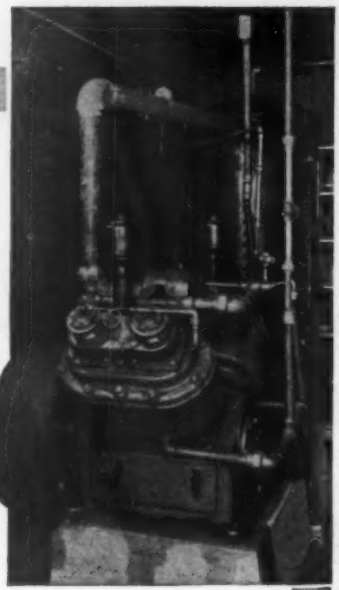
AMERICAN CHAIN & CABLE COMPANY, INC.
BRIDGEPORT · CONNECTICUT

ARMY E NAVY
FLYING OVER THE WRIGHT HOIST PLANT

ACCO
In Business for Your Safety

WRIGHT *Improved High Speed* **HOISTS**

CURTIS Air Compressor "Vital to Our Wartime Operations" Says Bronze Alloys Company



Having recently installed a new Curtis Air Compressor due to an increased demand for air, Mr. Albert Vigne, President of Bronze Alloys Co., St. Louis, writes:

"The air from this compressor is used throughout our foundry to operate molding machines, vibrators and air tools such as chipping hammers and hand grinders. As you know, *a dependable and uninterrupted source for compressed air is vital to our operations*—we can't do without it. To say that we are elated with the performance of our new Curtis Compressor is putting it mildly.

"We do not know the age of our other (Curtis) compressor . . . it is being held by us in reserve for emergency needs. The old compressor . . . was purchased in a used condition. It has served us faithfully, and were it not for the fact that our increased operations demanded more air, we certainly would be using it continuously because it is in excellent condition . . . "

Thus, another user of Curtis Model "C" Air Compressors expresses complete satisfaction with Curtis performance—a tribute to Curtis engineering, precision construction, and all-round rugged quality.

Curtis Air Compressors are Timken Bearing equipped and available in capacities up to 300 CFM. Send the coupon for complete information and free booklet, "How Air Is Being Used in Your Industry."

CURTIS
ST. LOUIS • NEW YORK • CHICAGO
PORTLAND • SAN FRANCISCO

CURTIS PNEUMATIC MACHINERY DIVISION OF CURTIS MFG. CO.
1924 Kienlen Avenue, St. Louis, Missouri

• Please send me your free booklet, "How Air Is Being Used in Your Industry," and further details concerning Curtis Model "C" Compressors.

Name.....
Firm.....
Address.....
City.....State.....

THIS "*Welch* PLANE" MAKES POSSIBLE THE FLIGHT OF OTHER PLANES

Cutting Tools are war tools. They are vital in the manufacture of planes, parts and other weapons of war.

At the outbreak of the war Welch Industries was one of the first to meet successfully the challenge of the metal working industry for precision made standard and special cutting tools. Today Welch Tools are setting new production records in war plants throughout America . . . an achievement worthy of mention and consideration.

WRITE FOR OUR STOCK LIST OF STANDARD CUTTERS

QUOTATIONS SUBMITTED ON SPECIALS

Welch

INDUSTRIES, INCORPORATED

Manufacturers of High Speed MILLING CUTTERS
FORM TOOLS • SPECIAL TOOLS
20000 W. Eight Mile Rd., Detroit 19, Michigan

ANNOUNCING...
PERMANENT MAGNETIC CHUCKS
...A NEW WALKER LINE

Greater in holding power and effective magnetic area

This new line of Walker Magnetic Chucks is the result of more than half a century's specialized experience in developing, designing and building Electro Magnetic Chucks. These new chucks, energized by the latest Walker method, can be depended on to retain their holding power indefinitely. Furthermore greater holding power is attained and a more effective magnetic area achieved through finer pole divisions and more magnetic surface.

Walker PERMANENT Magnetic Chucks are available for quick shipment in several standard sizes. Top plate design can be furnished in several different divisions thereby enabling Walker to supply the one best suited for holding your work. We are also prepared to design and build chucks for special applications.

●

If you are interested in time and cost savings as well as greater convenience and accuracy — write at once for complete details of the Walker line.

O. S. WALKER CO. INC.

WORCESTER, MASS., U. S. A.

ERRINGTON

Main Office and Works, Stapleton, Staten Island, N. Y.

TAPPING CHUCKS

NEW YORK
170 Broadway

CHICAGO
6422 N. Richmond Street

CLUTCH OR CONE DRIVE

Our High Speed Tappers are Super-Sensitive for Small Tapping

Style B Positive Stop Holds Work Down

Style C Graduated Adjustable Safety Friction

DRILL PRESS TURRET

Style D-E with Quick-Change Tool Holders to Drill, Tap and Set studs, etc., without moving work, or stopping or reversing machine. Individual friction adjustments in each tap-holder. If required. Also, Opening Die-Heads; Opening Stud-Setters; Friction Screw-Drivers and Nut-Setters, etc.

Is this YOUR Grinding Problem?

HOW TO REDUCE LOADING AND GLAZING OF WHEELS

One of the reasons leading concerns over many years have standardized on Oakite Grinding Compound for their wet grinding operations is that it effectively settles out chips . . . minimizes loading and glazing of wheels. Wheel dressing is less frequent . . . diamonds and other types of wheel dressers are conserved.

In addition, Oakite Grinding Compound provides maximum cooling and proper lubrication . . . assures smooth precision finishes. Write for FREE 20-page manual giving tested formulae.

OAKITE PRODUCTS, INC., 24 Thames St., NEW YORK 6, N. Y.
Technical Service Representatives Conveniently Located in All Principal Cities of the United States and Canada

OAKITE CLEANING

FAST, ACCURATE SPACING

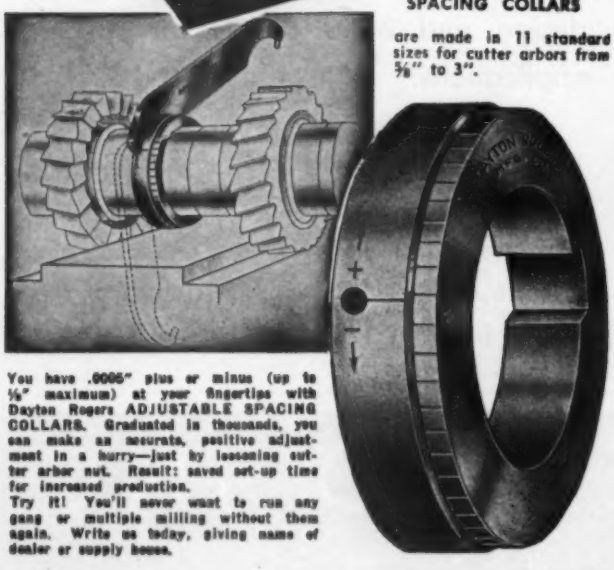
for

SIDE MILLING CUTTERS

GANG MILLING SET-UPS

DAYTON ROGERS ADJUSTABLE SPACING COLLARS

are made in 11 standard sizes for cutter arbors from 5/8" to 3".

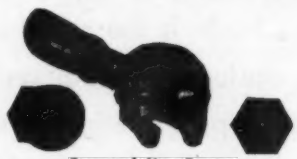


You have .0005" plus or minus (up to 1/8" maximum) at your fingertips with Dayton Rogers ADJUSTABLE SPACING COLLARS. Graduated in thousands, you can make an accurate, positive adjustment in a hurry—just by loosening cutter arbor nut. Result: saved set-up time for increased production.
Try it! You'll never want to run any gang or multiple milling without them again. Write us today, giving name of dealer or supply house.

DAYTON ROGERS MFG. CO. 2839 12th Ave. So. Minneapolis, Minn.

GRINDING WHEEL DRESSERS

Desmond Cutters



Desmond Hex Dresser

We manufacture a complete line of Dressers and Cutters. Write for copy of catalog "A".

DESMOND-STEPHAN MFG. CO.
URBANA, OHIO
Canadian D-S Mfg. Co., Hamilton, Ont.

ARMY-E-NAVY

CRAFTS

CARBIDE TIPPED

Consistent Quality

GAGES AND TOOLS

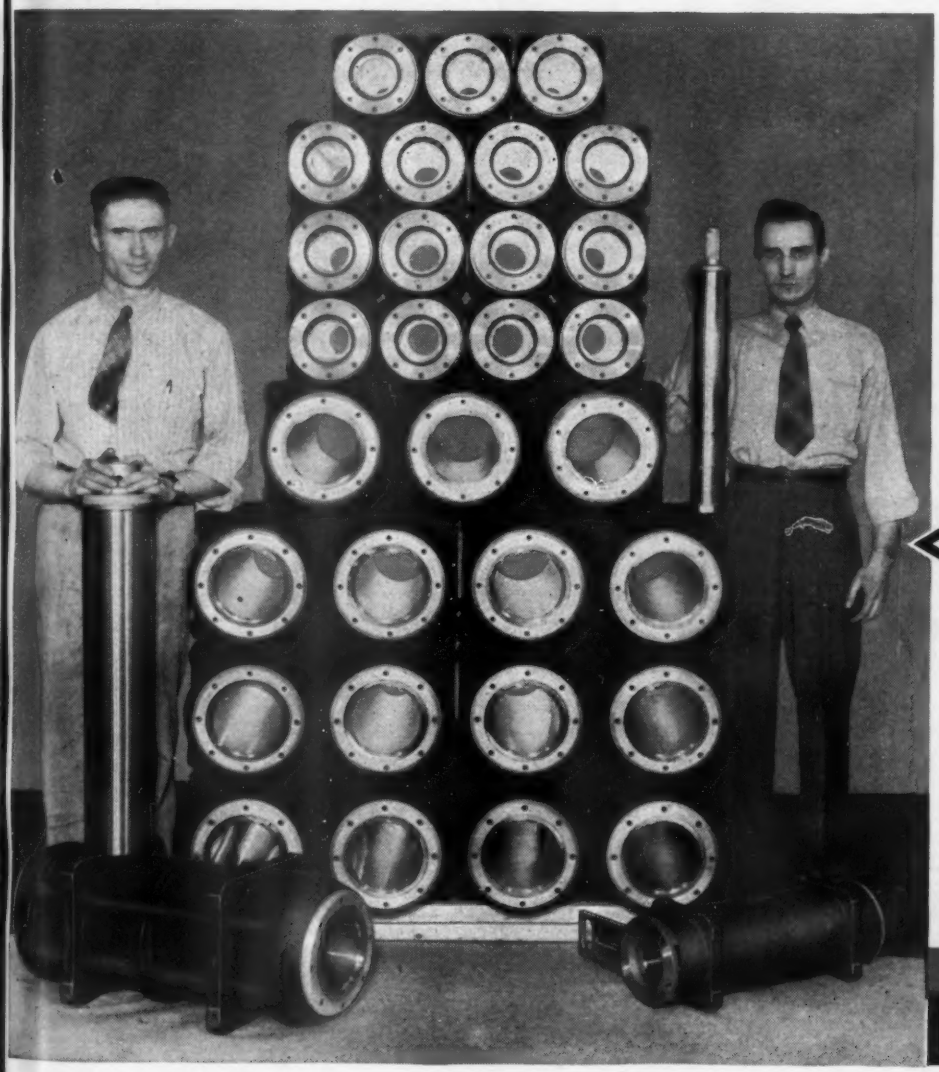
ARTHUR A. CRAFTS COMPANY, INC.

ACCURACY Huston ESTABLISHED

603 Newbury Street
at Kenmore Sq. BOSTON
DETROIT · CHICAGO

WRITE for Details About Our Complete Line of Cartridge Case Inspection Gages

Shown below are typical "Quality" Maximum Profile Chamber Gages now in the service of our Country. Each of the 32 gages must exactly fit the proper master checking plug.



● We are prepared to supply producers of ordnance materiel with gages of all sizes—from the largest to the smallest, either empty case or complete rounds. You are invited to write for our STANDARD LIST PRICES on: 20 MM, 37 MM, 40 MM, 57 MM, 75 MM, 76 MM, 90 MM, and 105 MM sizes. Other sizes quoted on request.

EST. 1929
QUALITY TOOL AND DIE CO.
REG. U. S. PAT. OFF.

407 N. Noble Street
INDIANAPOLIS 2, IND.

★

Manufacturers of "QUALITY" Products

ARMY E NAVY

Speed Victory...
BUY WAR BONDS

$38.50 SAVED EVERY DAY

Removable Basket loaded with metal chips ready for processing.

By reclaiming 17½ lbs. of oil from each load of metal chips, an American Chip Wringer has reduced a Detroit manufacturer's* cutting oil costs 50%. Running 2 loads an hour, 770 lbs. of oil are reclaimed in a 22 hour day, compared to 385 lbs. reclaimed by a Settling Tank. At 10¢ a lb. for oil, the American Chip Wringer thus saves $38.50 a day.

Less than 3 minutes running time per load. And any unskilled person can operate an American Chip Wringer.

American Chip Wringers are available in following models: 220, 226, 230, 240, 248.

WRITE TODAY FOR ILLUSTRATED CATALOGS

ARMY E NAVY

CINCINNATI PLANT

* Name furnished on request.

The AMERICAN LAUNDRY MACHINERY COMPANY

CINCINNATI 12, OHIO

UNIVERSAL DRILL BUSHINGS

ARMY E NAVY

UNIVERSAL ENGINEERING CO.

FRANKENMUTH, MICHIGAN

NICHOLSON EXPANDING MANDRELS

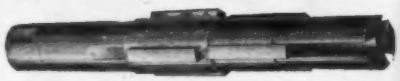
Give You Accurate High-Speed Production

Save Time! ★ ★ Improve Shop Efficiency!

Equip your shop with these economy tools for holding work while being machined. Hardened tool steel—precision ground.

Two Types—All Sizes

Sold Singly or in Sets



Bulletin No. 10-43

W. H. NICHOLSON & CO.

114 OREGON ST., WILKES-BARRE, PA.

Other Products: Arbor Presses—Control Valves—Steam Traps—Etc.

RANDALL & STICKNEY

New 1/10,000" Indicator

Model C-10

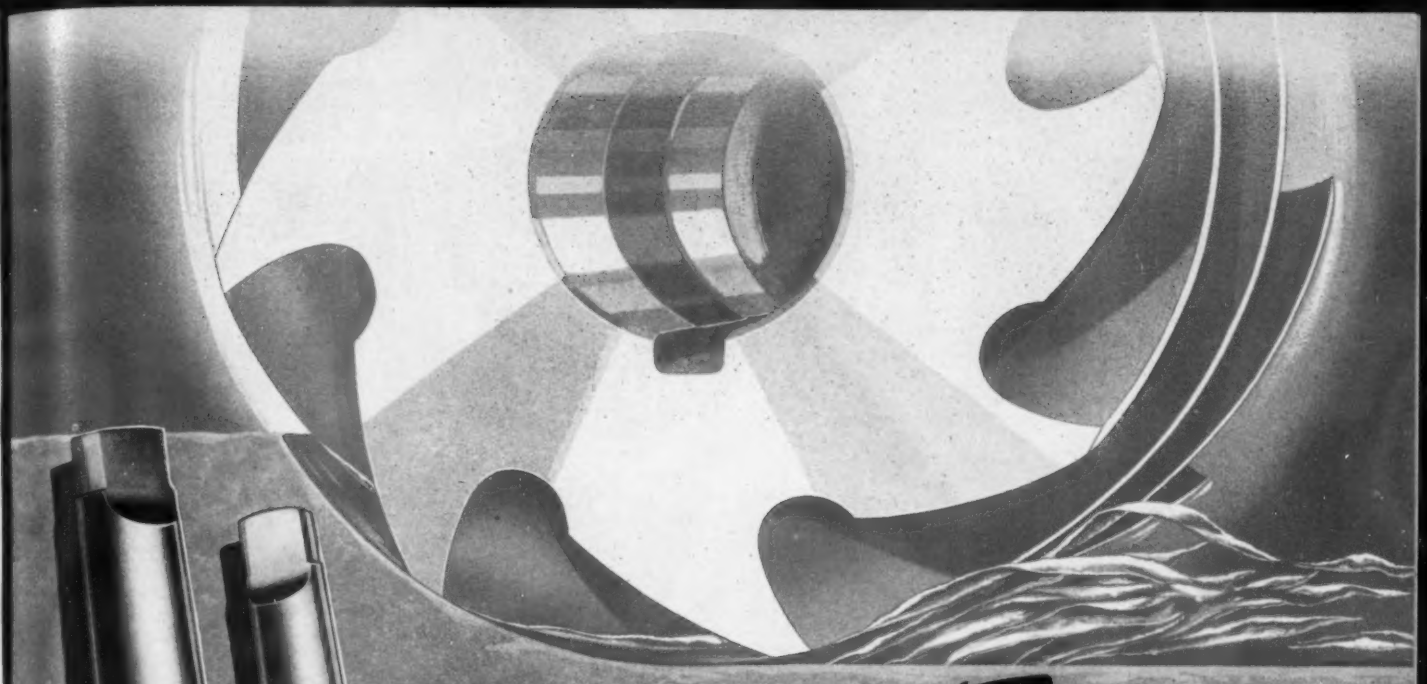
Range	.3"
Diameter of case	1 15/16"
Diameter over all	3⅛"
Depth of case	⅝"
Length over all	3⅛"
Lug or Bracket—Offset, on center if desired	Hole 3/16"
Back held in position by	4 large screws
Center of spindle to center of hole in lug	15/16"
Weight	5 ounces
Stem	9/32 diam.
Dial	0-5-0 or 0-10
Graduated	.0001"
Crystal	Non-breakable

Model C-10

RANDALL & STICKNEY

Waltham 54, Mass., U. S. A.

Makers of Gauges Since 1885



Searching For and Finding

THE RIGHT ANSWER TO METAL CUTTING PROBLEMS

SIXTY years' experience in solving difficult metal drilling, reaming, tapping, and cutting problems for customers has taught us to consider all possible answers rather than to depend on a single quality.

Given superb craftsmanship—which is a basic characteristic of all Standard Tools—the right answer to your tough job may lie in the formula, the heat treatment, design, testing, or any one of many factors.

To meet this situation, our products comprise thousands of items so that we may promptly select a standard drill, reamer, tap, or cutter that will meet not only all usual production problems but nearly any special condition that confronts you.

That's why we say—send us your tough jobs and we will let Red Shield Drills and Standard Reamers, Taps, and Cutters demonstrate their own merit.

"Red Shield" Brand
TWIST DRILLS
REAMERS
MILLING CUTTERS
TAPS • DIES
SPECIAL TOOLS

THE STANDARD TOOL CO.

CLEVELAND

NEW YORK STORE
94 READE STREET

DETROIT STORE
6553 HAMILTON AVE.

CHICAGO STORE
552 W. WASHINGTON BLVD.

Side Milling Cutter, Staggered Tooth. No. 704— High Speed Steel.
Side Milling Cutter. No. 702— High Speed Steel.
TOOLS THAT WELCOME TOUGH MILLING JOBS
Concave Cutter. No. 721— High Speed Steel.
Below, two styles Helical Milling Cutters.
Plain Milling Cutter, Light Duty. No. 700— High Speed Steel.
Taper Shank End Mill. No. 763— High Speed Steel.
Double End Mill, High Helix Type. No. 767A— High Speed Steel.
Metal Slitting Saw with Side Chip Clearance. No. 703— High Speed Steel.
Plain Milling Cutter, Heavy Duty. No. 800— High Speed Steel.
Metal Slitting Saw. No. 724— High Speed Steel.

THERE is a definite advantage to you in Standard's manufacturing policy. Briefly, that policy is and has been for over 60 years, "to make the finest tools that skill and progressive modern manufacture can produce". Shield Brand milling cutters, like all Shield Brand tools, welcome an opportunity to demonstrate their superiority on tough jobs.

THE STANDARD TOOL CO.

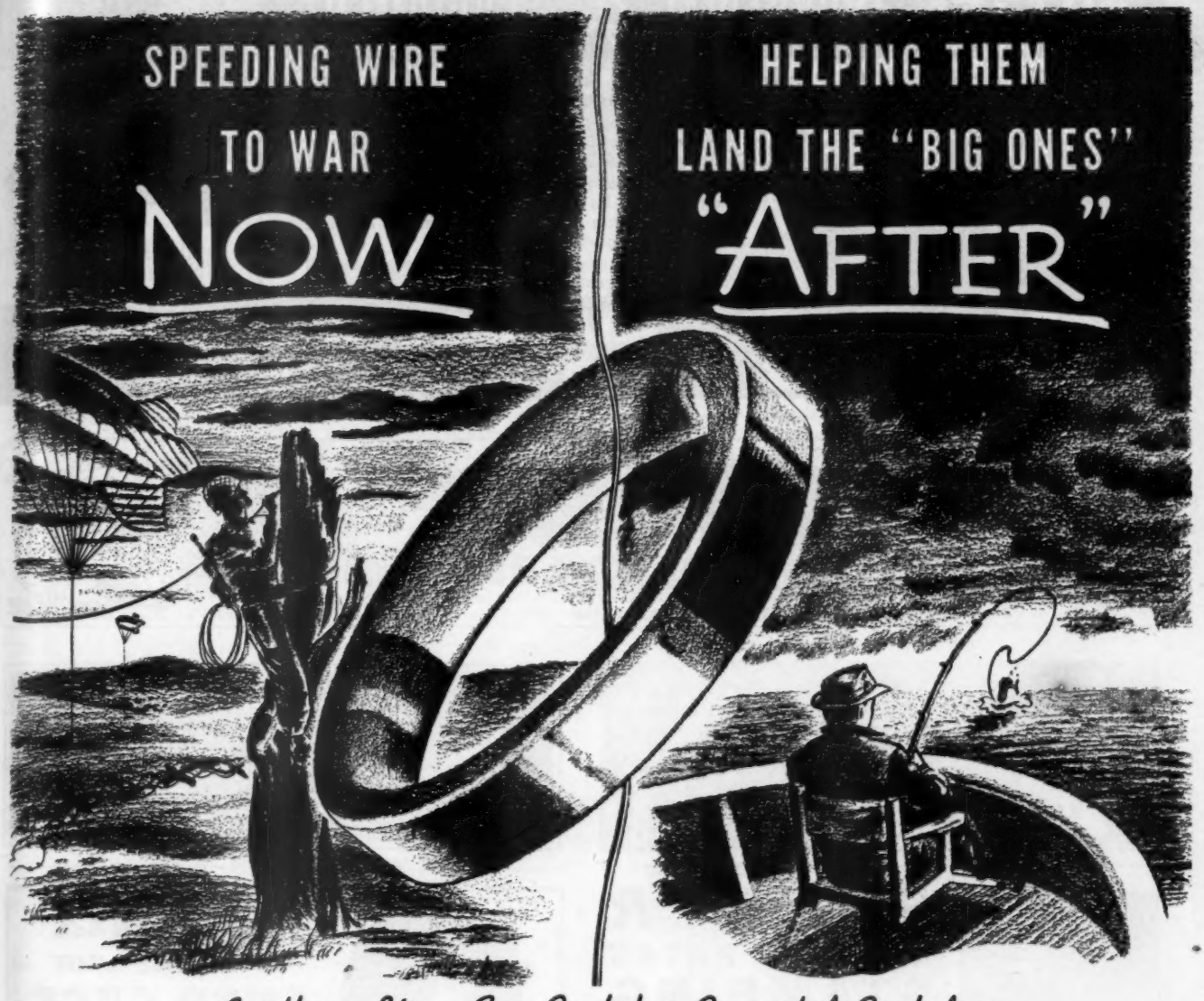
CLEVELAND

"Red Shield" Brand Drills

NEW YORK STORE
94 READE STREET

DETROIT STORE
6553 HAMILTON AVE.

CHICAGO STORE
552 W. WASHINGTON BLVD.



Another Use For Carboloy Cemented Carbides

BY INCREASING the life of wire guides as much as 50 to 1, Carboloy rings—replacing ordinary rings—help keep wire stranding machines operating at peak efficiency for long periods of continuous use—stepping up output of wire cable for war. These same rings, in peacetime, are also used as guides on many fishing rods, to protect your line from wear, keeping it unfrayed and flowing smoothly.

Such uses of Carboloy Cemented Carbides *as parts of your products* to help reduce excessive wear, often solve many otherwise difficult operating and maintenance problems caused by abrasion, corrosion or erosion. For such applications, Carboloy is available in practically any shape or size. It may be used as an integral part, or as an insert at the point of wear, in parts made of other metals.

This unusual ability of Carboloy Cemented Carbide to resist wear has improved the performance of many products including oil well pumps, homogenizing equipment, machine tools, textile machines, bread slicing equipment, welding rod, business machines, fishing rods, spray guns, telegraph equipment, kitchen disposal units, etc.

A small piece of Carboloy Cemented Carbide, at a vital point in your product, may solve *your* wear problem.

. . . to stop excessive wear
on vital parts of your product

CARBOLOY

TRADE MARK

CEMENTED CARBIDE for WEAR-RESISTANT USES

CARBOLOY COMPANY, INC., Detroit, Michigan
SOLE MAKERS OF THE CARBOLOY BRAND OF CEMENTED CARBIDES

BIRMINGHAM 3, ALA. • CHICAGO 7, ILL. • CLEVELAND 4, OHIO • LOS ANGELES, CALIF. • NEWARK 2, N. J.
PHILADELPHIA 22, PA. • PITTSBURGH 19, PA. • SEATTLE 4, WASH. • THOMASTON, CONN.

BUZZER INDUSTRIAL *Gas* EQUIPMENT

Reg U.S. Pat. Off.

No Blower or Power is needed to reach High Temperatures with a "BUZZER" Gas Furnace . . . just connect to your gas supply.

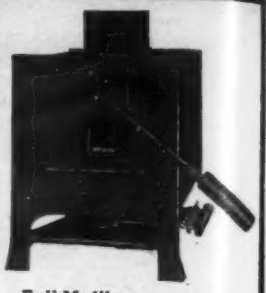
Rectangular Heat Baths

For liquid heat treating baths, soft metal melting, etc.

The High Speed Full Muffle Furnace attains a temperature of 2400° F., and is designed for High Carbon and Alloy Steels.

BUZZER Rectangular Heat Baths meet the increasing demands for large liquid Heat Bath Furnaces, and are built in many sizes. Also made in round type pot furnaces

Send for the new BUZZER Catalog showing full line of Gas Furnaces, Burners and other equipment.



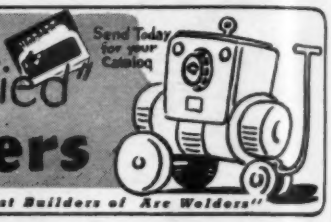
Full Muffle Furnace (Bench Type)

CHARLES A. HONES, INC.

121 South Grand Avenue Baldwin, L. I., N. Y.

HOBART "Simplified" arc welders

with the original and exclusive REMOTE CONTROL



Send Today for your Catalog

HOBART BROTHERS CO., Box A.M. 3-2 TROY, OHIO *"One of the World's Largest Builders of Arc Welders"*

Avey Sensitive DRILLING MACHINES

CINCINNATI OHIO

LUERS

Patented Cutting Off Tool Holders
Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

Manufactured By
J. Milton Luers — 12 Pine St. — Mt. Clemens, Mich.
Produced under License Issued by John Milton Luers Patents, Inc.

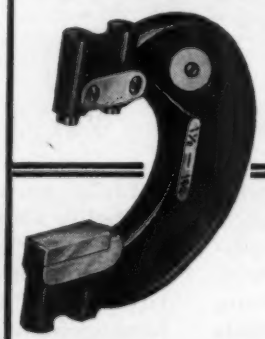
FASTER HAND OR PRESS STAMPING

12 characters, more or less, stamped at one blow. Press the thumb clip and quickly change type or dies for next markings. No weakening groove in type. Heavy Duty Type with "Extra Strength Shoulder" stamps any untempered steel, or other material. Ask for HERCULES HOLDER & TYPE.

Write for literature and price lists.

THE ACROMARK CO.

7-13 MORRELL ST. ELIZABETH, NEW JERSEY



PHOENIX ADJUSTABLE LIMIT SNAP GAGE

A Gage with Locking Cams which will stay set

Good Delivery

Send for Folder

PHOENIX GAGE CO., Phoenix, N.Y.

For Employee Training

"THE TOOLS OF OUR TRADE" . . . *American Machinist's* 16-page special section on elementary shop practice now available in reprint form.

AMERICAN MACHINIST—330 W. 42 St., New York, N. Y.
Please send me.....copies of "The Tools of Our Trade"

Name .....

Title .....

Firm .....

Address .....

Production executives will find in this exactly the type of information needed by new workers. Removes the chief obstacle to the novice's progress—the simple fact that he doesn't know the names of things. Covers measuring, gaging, marking, holding, cutting, forming and milling tools. Basic instruction data which will save you months of preparation time.

10c each—MAIL COUPON TODAY

BAKER

Model 60-HO

HELPS KEEP VITAL RAIL EQUIPMENT ROLLING!

• A new adaptation of BAKER Model 60-HO, with extended side bed is now in use, handling operations of trepanning, rough and finish boring main and side rods for railroad equipment. This is an important job . . . one which is helping the railroads carry on the splendid and war-vital job they are doing.

Features that make Model 60-HO ideal for this job include:

Heavy spindle 6.250" diameter in lower head bearings.

Spindle end flanged for adapting trepanning cutter heads and boring cutter heads direct to spindle. This eliminates necessity of support bracket from frame as used on older model machines.

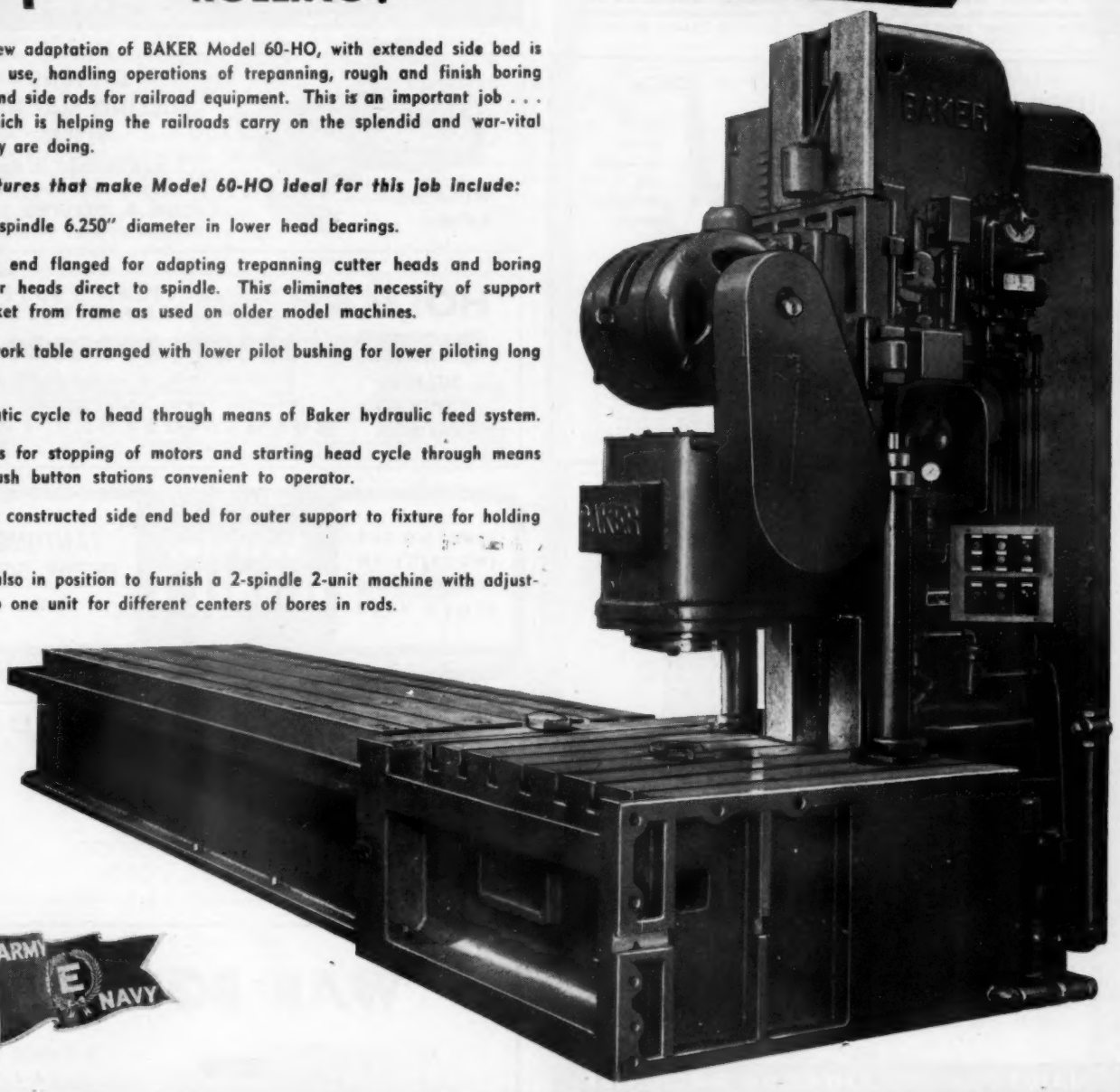
Main work table arranged with lower pilot bushing for lower piloting long bars.

Automatic cycle to head through means of Baker hydraulic feed system.

Controls for stopping of motors and starting head cycle through means of push button stations convenient to operator.

Heavily constructed side end bed for outer support to fixture for holding rods.

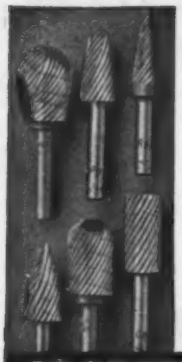
Baker also in position to furnish a 2-spindle 2-unit machine with adjustment to one unit for different centers of bores in rods.



BAKER BROTHERS, INC. • Toledo, Ohio, U.S.A.

DRILLING • BORING • TAPPING

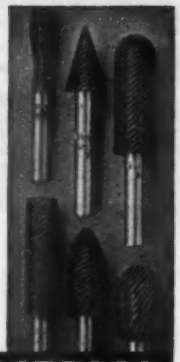
Our Motto Since 1867: "Machines Sturdy and Efficient, as Fine as Can Be Built..."



Grobet
ROTARY FILES
Hand Cut • Milled Cut
Ground from the Solid

There is a GROBET ROTARY FILE in shape, size and coarseness of cut for every type of hard or soft metal, plastic, wood, etc. GROBET FILES do their jobs better and stay sharp longer.

Send for catalog DR, the most complete of its kind illustrating and describing GROBET Rotary Files, Diesinkers, Burs, Tube Burring Cutters, Chatterless, Countersink, etc.



GROBET FILE CO. of AMERICA

421 Canal Street (1812 P. L. GROBET) **New York, 13 N. Y.**

IMPORTERS OF GROBET SWISS FILES — MFRS. OF GROBET ROTARY FILES

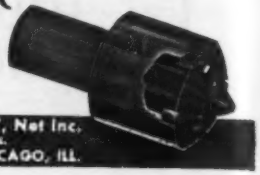
DIAMONDS for Victory

BIG-HED-NIBS
LOC-KEY-SET

RE-SET-ABLE
Cooler dressing
Closer Tolerances
Micrometer Accuracy
Because: Wing key heat dissipation and absolute diamond lock nib.

Three grades of diamonds. Common quality $12 per karat. Medium quality $24 per karat. Select quality $48 per karat. (Contour template diamonds supplied only in Medium and Select quality.)

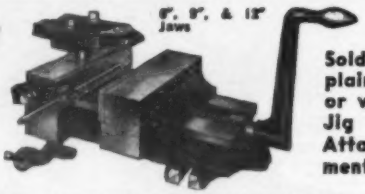
All diamond sizes 1/4 to 10 karat are all mounted for immediate shipment . . . Bills subject to approval. Specify quality of diamond wanted. We recommend a minimum size of one karat for each 6" diameter of grinding wheel. (24 hour resetting service, $2.00 per t paid.) Grinders Instruction card free.



The Most Complete and Up-to-the-Minute Line of Diamond Tools for War Production. Send for Free Catalog.

DIAMOND TOOL COMPANY, Not Inc.
Sheldon M. Booth, Pres.
9 E. 41st Street CHICAGO, ILL.

LEARN WHAT THIS VISE CAN DO 3 SIZES



Sold plain or with Jig Attachments

GRAHAM MULTI-PURPOSE VISE

A profusely illustrated new circular shows how these Vises—with their numerous Attachments—serve an endless variety of regular and special holding jobs on planer, drill press, radial, miller, shaper, grinder. Special guides, stops, V-jaws, shell jaws, etc., etc., all readily attachable.

Ask About Our Knurl Holder Fittin Lathe Turret
Request Illustrated Price Circulars

GRAHAM MFG. CO. BRIDGE STREET EAST GREENWICH, R. I.

Write for Bulletin

STEVENS MILLING MACHINE VISES

5 in., 6 in. and 7 in. sizes
All parts Interchangeable
JOHN B. STEVENS INC.
474 Canal St., New York 13, N. Y.

HOLMAN *BETTER, FASTER HOLE FINISHING*

HELICAL TAPER PIN REAMERS

Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

HOLMAN REAMER CO.
MANCHESTER, CONN.

LEADING THE INDUSTRY IN CARBIDE TOOLS SINCE 1930

Vascoloy RAMET

TANTUNG CUTTING TOOLS — DIES 430

VASCOLOY RAMET CORP. • NORTH CHICAGO, ILLINOIS

DIES *TAPS*

GEO MET RIC
Right in the Lead
THE GEOMETRIC TOOL CO.
NEW HAVEN 15, CONN.

WAR BONDS
are
WAR WEAPONS
★ ★ ★ ★
Invest to the limit!

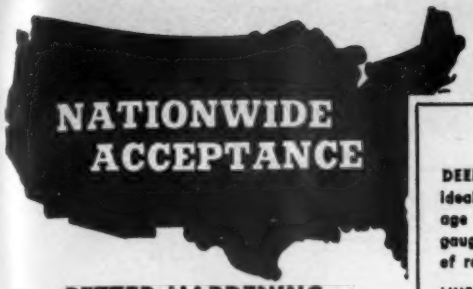
TO HELP NEW EMPLOYEES BECOME SKILLED OPERATORS

No. 5 in the series of special training sections on "Tools of Our Trade," appearing originally in *American Machinist*, this 16-page illustrated booklet presents a summary of the facts about the process, the machines and tools in the field of grinding. Will help reduce training time. Reprints available at 10c each; less in lots of over 500. Use coupon below.

MAIL TODAY TO AMERICAN MACHINIST

AMERICAN MACHINIST, 330 W. 42nd St., New York 18, N. Y.
Please send me.....copies of "How to Run a Grinding Machine."
Enclosed is $.....(in stamps, check, money order).
Name .....
Title .....
Company .....
Address .....

AMERICAN MACHINIST • 330 W. 42nd St., New York 18, N. Y.



**BETTER HARDENING—
BETTER RESULTS**

We can make your tools do more work, and last longer, too. We have U. S. Army and U. S. Navy Aircraft Approval for heat treating, obtained after rigid tests and careful check-up by Army and Navy personnel.

Perfection's skilful work is helping manufacturers in 31 states . . . 26 years specializing in treating tools, dies, molds, and "fussy" mechanical parts. We treat tons of tools—in wide variety. Many require the use of 5 or 6 furnaces to get just the right result. When ordinary methods do not suffice, we have new ones: Deep-freezing, Nusite, and Silverfinish.

Tell us your problems. We have the equipment, skill, and experience to solve them quickly and economically.

★

DEEPFREEZING—The ideal way to quick-age parts, stabilize gauges, and get rid of retained austenite.

NUSITE — Produces higher hardness (65 to 67 Rockwell C) throughout high speed cutting tools and still they are almost twice as tough.

SIVERFINISH — Bright hardening . . . up to 1900 deg. F. No scale or discoloration. Polished pieces retain their shine. Saves grinding. Fine for engraved dies, threaded parts, die casting, and inserts.

★

**PERFECTION
TOOL & METAL HEAT TREATING CO.**
1740-58 WEST HUBBARD STREET CHICAGO 22, ILL.

TOOL IMPROVEMENTS CO.

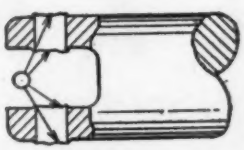
TICO

SPECIAL TOOLS AND EQUIPMENT

ANNOUNCING

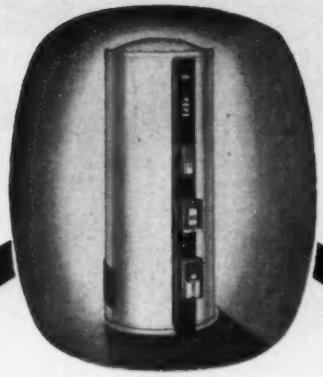
A NEW TOOL
called the
"BURROFF"

*FOR BURRING
AND CHAMFERING
THE SHARP CORNERS
ON PARTS LIKE THESE →*



***Sales Agents:* JOHN H. GRAHAM & CO., INC.,**
105 Duane Street New York, N. Y.

Write for Descriptive Folder and Prices.



$5000.00

A YEAR SAVING ON HYDRAULIC OILS . . . *with Honan-Crane oil purification equipment*

A large manufacturing company has been using Honan-Crane Oil Purification Equipment on several types of installations with great success. They recently called in a Honan-Crane Resident Engineer to make a survey of their hydraulic equipment and after tests were completed put the recommended system of purification into effect.

This program of Honan-Crane Oil Purification brought these outstanding results:

- Periodic removal of all contamination from the oil produced greater machine efficiency, less down time and less maintenance.
- 12,000 gallons of oil saved each year.
- Low purifying costs—$475.00 per year.
- Direct connected operation prevented any possibility of mixed oils.
- Systematic plan guaranteed maximum protection.
- Total net saving per year $5,000.00.

This $5,000.00 saving in oil represents but a small part of the many thousands of dollars that will be saved by increased production on these machines. Elimination of the contamination in the oil will greatly reduce the down time necessary for repairs and overhauling of worn parts brought about by excessive and unnecessary wear.

For complete information on the purification of any kind of lubricating or industrial oils write—

**HONAN-CRANE
CORPORATION
205 WABASH AVENUE
LEBANON, IND.**

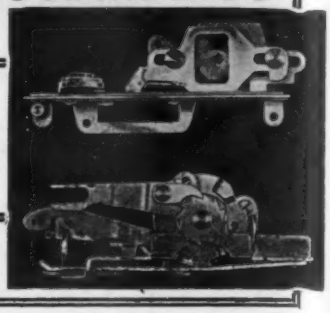
CONTRACT WORK

ADDITIONAL FACILITIES FOR CONTRACT MANUFACTURING

Hand screw machines up to 1½ dia.
Turret lathes up to 15" dia.
Milling machines
Engine lathes
Bench lathes
Dril lpresses
DoALL contour cutting machine

RELIANCE MACHINE & MFG. CO.
30 Irving Place, New York, N. Y.
established 1922

STAMPINGS AND ASSEMBLIES
"GREATER SAVINGS WITH GREIST"



We can make short or long runs in any metal. Our modern equipment and methods, backed by 50 years of experience, are your guarantee of satisfaction. We are also fully equipped to make
SCREW MACHINE PRODUCTS
TOOLS, DIES, JIGS, FIXTURES
Quality work by skilled mechanics is assured. Send your blueprints or samples today.

THE GREIST MFG. CO.
546 BLAKE ST. NEW HAVEN, CONN.

MACHINE SHOP
Facilities include 9" South Bend Bench Lathe, #2 Brown & Sharpe Milling Machine, Drill Press and 8" x 8" Shaper. The usual line of hand tools and equipment plus experienced workmanship assure your satisfaction. Your inquiries invited.
C. VANDEGRIFT CO., HOCKESSIN, DELA.

CONTRACT WORK—

We can build machines and parts, special tools and fixtures of all kinds to your specifications and design. Skilled workmen and modern equipment are your guarantee of satisfaction. The design and building of wire and ribbon stock forming machines are our specialty.

We solicit your blueprints or samples for quotation. No obligation of course.

THE A. H. NILSON MACHINE COMPANY
Bridgeport, Conn.

PRECISION FORM GRINDING
Specialists in grinding Circular and Flat FORM-TOOLS, FORM Counterbores, FORM Flat-Drills, and related types of FORM grinding. Also step-grinding of Tungsten and Molybdenum Rods.
Send Prints for Quotation and Delivery
J. & S. TOOL CO.—477 Main St.—E. Orange, N.J.
(Makers of J.&S. Radii & Angle Dressing Tools)

TANK AND SHEET METAL WORK

We are equipped to manufacture to your specifications tank work, such as storage tanks, pressure tanks, etc. Our welders are experienced in welding steel, stainless steel, Monel metal and Everdur; also brazing of all descriptions. They are certified for welding under the ASME Code Unfired pressure vessels. We also have certified Navy Aeronautical welding under certain specifications. Send your blueprints for prompt quotations.

BOWSER, INC.
1302 E. CREIGHTON FT. WAYNE 5, INDIANA

METAL STAMPINGS
• TOOLS • DIES •
PERMANENT MAGNETS
HEAT TREATING
THOMAS & SKINNER
STEEL PRODUCTS CO.
1103 E. 23rd St. INDIANAPOLIS, IND.

WIRE AND METAL SPECIALISTS
in round, flat, square and special shaped wire in all metals.
LARGE PRODUCTION CAPACITY
Plating and finishing.
EASTERN TOOL & MFG. CO.
BLOOMFIELD, N. J.

Additional
Contract Work Advertising
on opposite page

PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us—we will take care of them
GENERAL PATTERN WORKS
2233 Buck Street Cincinnati, Ohio

GEAR BLANKS

WE CAN MAKE QUICK DELIVERY ON YOUR GEAR BLANKS

Send Us Your Prints for Quotation

PRECISION MOTORS COMPANY, 119-22 Park Place, Richmond Hill 19, N. Y.

WANTED
PLANT SUPERINTENDENT

Pacific Northwest Centrifugal and Turbine Pump Manufacturer, in business 20 years, is now making plans for current and postwar production. Needs a plant superintendent with the following qualifications:

1. **Thorough knowledge of the machinist craft and of the equipment used by machinists**
2. **A minimum of five years experience involving supervision of a number of people**
3. **A background of experience in planning and organizing the daily work of men, machines and materials**
4. **Although experience in the pump industry desired, this is not requisite**
5. **Ingenuity in development of fixtures and machine set-up to reduce manufacturing time to a minimum is of major importance.**
6. **Most important is ability to direct and lead men**
7. **Fundamental training in supervision such as given by Training-Within-Industry Division of War Manpower Commission, Job Instruction Training, Job Methods Training, Job Relations Training, Safety Engineering, National Foreman Institute, etc.**

This company is willing to pay in proportion to the individual's ability to do this job. At present this company is considered 100% essential in War Production. This is an opportunity for the right individual to assure his postwar future.

Send history of experience and photograph to
P-769, AMERICAN MACHINIST
68 Post Street **San Francisco 4, Calif.**

WANTED — ESTIMATOR ON
STEEL FORGINGS

By large Midwestern forge plant engaged in war work. Must be able to do complete job of estimating and rate computation — open hammer, drop forge and flat die forgings. Well rounded experience and education necessary. Excellent post-war opportunity. Give full details in first letter.

P-779, AMERICAN MACHINIST
520 NORTH MICHIGAN AVENUE
CHICAGO 11, ILLINOIS

WANTED
HOT AND COLD FORGINGS INSPECTORS

By large Midwestern plant engaged in war work. Must be experienced on drop, flat die and upset forgings. Excellent post-war opportunity. Give full details in first letter.

P-780, AMERICAN MACHINIST
520 North Michigan Avenue
CHICAGO 11, ILLINOIS

WANTED — PRODUCT DRAFTSMAN

A permanent position for qualified man, with good opportunity for advancement with a nationally-known New England manufacturer of mechanics tools.
Details of experience and draft status requested. Address inquiries to
P-768 AMERICAN MACHINIST
330 West 42nd St., New York 18, N. Y.

WANTED — TOOLMAKER

who has had enough experience to take charge of tool room on special machine tools, jigs, fixtures, and gages, for our own plant. Excellent post-war opportunity for man who desires to get connected with a progressive concern established in 1933. Factory located on beautiful Lake Shore Drive, in southwestern Michigan. Give all details and salary expected in first letter.
P-701, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

MACHINE TOOL DESIGNER WANTED

For a leading manufacturer of machine tools, still very busy and with big post-war business in prospect. Excellent opportunity for experienced man. In reply give age, dates worked for last three employers, with name of man to whom you reported, and approximate salary desired. Present employer will not be contacted unless you authorize it.

P-783, AMERICAN MACHINIST
330 WEST 42nd STREET
NEW YORK 18, N. Y.

WANTED—EFFICIENCY MAN

On the manufacture of small Diesel and Gasoline Engine parts who has had previous experience in time study on similar work. Must also know how to advise operators to improve their method. Regular product now being used extensively in war work, and will also be made in peace time.
WITTE ENGINE WORKS
1600 Oakland Ave., Kansas City 3, Missouri

WANTED
MODEL MAKER

For experimental and development work on small, accurate mechanisms. Inventive talent desirable. Able to work to close tolerances.

Permanent position with large corporation located in Manhattan.

Write stating age, draft status, education, experience and compensation desired.

P-782, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

POSITIONS VACANT

These Positions Vacant advertisements are published subject to agreement by the advertisers not to consider applicants now employed on war work unless they obtain written release from present employer.

MECHANICAL DRAFTSMAN with practical mechanical experience in blanking, drawing and forming dies for sheet aluminum products in defense work by old established company in Central West; give experience and full particulars. P-667, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

TOOL MAKERS for defense plant in Central West; give experience and full particulars. P-668, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

MECHANICAL DRAFTSMAN familiar with code designs for pressure vessels and refinery piping. Knowledge of machine design desirable. Not a duration job. Magnolia Petroleum Company near Dallas. Give details of experience and availability. Persons now employed in essential industry must have statement of availability. P-766, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

EXPERIENCED ESTIMATOR WANTED: By old established middle-west Manufacturer Tools, Jigs, Dies. This is a permanent opportunity for man with recent or active experience. Company has been in business more than 20 years and is one of the largest in the country. Write with complete confidence. State of availability required. Address P-770, American Machinist, 330 W. 42nd St., New York 18, N. Y.

SUPERINTENDENT WANTED: Tool and Die Plant. Large well established Ohio Manufacturer has permanent opportunity for personable, aggressive man with recent comprehensive experience. Plant is modern, well equipped and now serving major industries. Write in confidence, state experience fully, for prompt reply. Must be eligible under W.M.P.C. Address P-771, American Machinist, 330 W. 42nd St., New York 18, N. Y.

MECHANICAL ENGINEER and Designer, to work out details of mechanical devices and make them effective. P-774, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PRODUCTION AND SALES ENGINEER, to develop and head a Light Punch Press Products Business, to be based upon a new, highly productive Punch Press. Must be a practical, resourceful production man with sales and executive ability. P-775, American Machinist, 330 W. 42nd St., New York 18, N. Y.

(Continued on page 276)

CONTRACT WORK

(Continued from opposite page)

Gray Iron and Semi Steel Castings, also alloyed with nickel, chrome, and molybdenum. Wood, Iron, Brass and Aluminum pattern work.

KING FOUNDRIES, INC.
Phone 823 North Wales, Montg. Co., Pa.
22 Miles from Philadelphia, Pennsylvania

PLANT EMPLOYING 200 PEOPLE HAS PRODUCTION TIME OPEN

- CENTERLESS
- TURRET
- MILLERS
- SHAPERS
- GRINDERS
- LATHES
- SUPPORTING EQUIPMENT

Over 200 Machine Tools

BERGEN MACHINE & TOOL CO., INC.
189 Franklin Ave., NUTLEY 10, N. J.

ADDITIONAL POSITIONS VACANT ADVERTISEMENTS ON PAGE 276

SEARCHLIGHT SECTION

(Continued from page 275)

EMPLOYMENT SERVICE

SALARIED POSITIONS—This advertising service of 34 years' recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details. R. W. Bixby, Inc., 266 Delaware Bldg., Buffalo, N. Y.

POSITIONS WANTED

SUPERINTENDENT or General Production Foreman. Sixteen years general foreman specialising in all semi automatics, planning and layout, estimating, designing, tooling and retooling. Complete charge of 150 men. 35 years practical experience. Would welcome a small rundown shop. PW-775, American Machinist, 330 W. 42nd St., New York 18, N. Y.

ENGINEER, age 58, experienced in machine methods for low cost production and the development of product design, desires a connection with a firm having a post war program. Competent to organize, train, and supervise. New York State preferred. PW-776, American Machinist, 330 W. 42nd St., New York 18, N. Y.

SELLING OPPORTUNITIES

OFFERED—WANTED

Selling Agencies—Sales Executives

Salesmen—Additional Lines

WANTED

ENGLISH IMPORTER of machine tools, agricultural machinery and similar products with extensive selling organization and manufacturing facilities for articles outlined above and also factory suitable for production of household or similar mass produced small machinery desires to acquire sole selling or manufacturing rights for articles of above or similar nature. Representative will be available USA February to April. Apply RA-767, American Machinist, 330 W. 42nd St., New York 18, N. Y.

MANUFACTURERS REPRESENTATIVE covering Illinois and Iowa wants additional tool lines, milling cutters, taps, special high speed and carbide tools, grinding wheels or other lines. P. O. Box 321, Davenport, Iowa.

MECHANICAL MAN—Exceptionally high grade —with excellent mechanical background and successful sales experience wants any kind of machinery to sell Connecticut district. Can demonstrate. SA-778, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PATENT ATTORNEY

PATENTS, COPYRIGHTS, Booklet, "General Information Concerning Inventions and Patents" and "Free Schedule" sent without obligation. Established 1915, Lancaster, Allwine & Rommel, Suite 453, 815-15th St., N. W., Washington, D. C.

BUSINESS OPPORTUNITY

PROMINENT LONG-ESTABLISHED ENGLISH MANUFACTURER and Merchant in Machine Tools wishes to represent American Manufacturers in the English market. Also wishes to manufacture under License medium or heavy machinery such as hydraulic presses or agricultural machinery. Submit details of your product if you wish aggressive, productive sales promotion. BO-772, American Machinist, 330 W. 42nd St., New York 18, N. Y.

CONTRACT WORK

WORK WANTED—For advertisement of work wanted see pages 274 and 275.

WANTED

ANYTHING within reason that is wanted in the field served by American Machinist can be quickly located through bringing it to the attention of thousands of men whose interest is assured because this is the business paper they read.

WANTED: MANUFACTURERS' REPRESENTATIVE

A number of territories open to sell on commission basis outstanding Machine Tool Accessory line also a Flexible Coupling of exceptional merit. Write giving full details as to present connections and past experiences. All correspondence kept confidential.

RW-786, AMERICAN MACHINIST
330 West 42nd Street New York 18, N. Y.

EXPERIENCED PRODUCTION EXECUTIVE WANTED

A prominent machine tool builder, still very busy and with excellent post-war prospects, is seeking a thoroughly experienced production executive. Excellent opportunity for capable man, thoroughly experienced in manufacture of machine tools or similar large equipment. In reply please give age, dates of employment in last three positions and salary expected. Present employer will not be approached until permission is given to do so.

P-784, AMERICAN MACHINIST
330 WEST 42nd STREET
NEW YORK 18, N. Y.

WANTED
Manufacturing Executive

to fill office of vice president in charge of manufacturing, 38 to 60; thoroughly familiar with the manufacture of all parts used in small Diesel and Gasoline engines. Must know all methods and practices to produce them economically, also to coordinate for mass manufacturing, so that the assembly line will not be held up for want of any one thing. Our regular products are being used extensively in war work. Same products will be sold to the trade after the war. Must be capable of earning over $6000 a year. After capability is proved, would be willing to share profits.

WITTE ENGINE WORKS
1600 Oakland, Kansas City 3, Missouri

WANTED: A PRODUCT TO MANUFACTURE

Organization of several hundred skilled designers, engineers, toolmakers and a modern tool room seeks post war product or machine. Complete facilities for development — engineering — manufacturing — sales and advertising. Will be handled on royalty basis or any other satisfactory arrangement.

BO-781, American Machinist
330 West 42nd Street
New York 18, N. Y.

WANTED — YOUR PRODUCTS

Sales Engineer will represent you in Mo. Want lines of Cutting and Machine Tools. Also sub-contracting. Am. M. E. and will handle jig and fixture work. Qualified to give technical service. Write

T. P. MURPHY
7508 EUNICE AVENUE, ST. LOUIS 20, MO.

NEW INVENTIONS WANTED

Mechanical and electrical devices for post-war manufacture and sale. Either new ideas, or improvements upon present methods.

P. O. Box 217, Denville, N. J.

NEW INVENTIONS WANTED

Seeking small or medium size devices, preferably items for post-war consumer trade. Patents purchased outright or on royalty basis.

CLARK MACHINE CO.
Brant Avenue, Clark (Rahway) N. J.

IF YOU ARE DOING DEFENSE WORK

Send for Our Latest Circular Covering Bargains in Small Tools Such as Drills, Reamers, Turret Attachments, etc.

DEWITT TOOL COMPANY
173 Grand St. New York City

COMPRESSORS

300 CFM Chi. Pneu. with 75 H.P. motor
520 CFM Ingersoll-Rand, Style "JO"
940 CFM Ingersoll-Rand Type 10XB horiz. 2-stage, steam driven with receiver.

MISCELLANEOUS

36" Niles Center Driven Lathe for truing R.R. Wheels mounted on axles.
48" Niles Bement Pond Car Wheel Borer, motor drive.

TRACTOR WAGONS

Allis Chalmers Speed-Age 7½-yd. capacity. In excellent condition.
Write for illustrated bulletin!

IRON & STEEL PRODUCTS, INC.
13498 S. Brainard Avenue
CHICAGO 33, ILL.
"Anything containing IRON or STEEL."

SCREW MACHINES

NEW BRITAIN ⅝", 1" 1⅛" six spindle auto. M.D.
BROWNE & SHARPE #0, #2, auto. M.D.
CLEVELAND ¾" cap. single spindle.
BLISS & ADRIANCE single and double action pressure.

National Machinery Exchange
"If it's Machinery—We Have It"
134-138 Mott St., NEW YORK, N. Y.

PRESSES

No. 4¾ Bliss Double Crank Overhang Geared Press, stroke 4", bed area 31" x 24", frame to center of ram 8⅛"; width between housings 38"; die space 11". Catalog Weight 18,000 lbs.

Good condition. Immediate delivery.

GALBREATH MACHINERY CO.
Empire Building PITTSBURGH, PA.

No. 00G B & S Automatics
2¼" J & L, chucking
Carlton 4' Radial Drill, motor on arm

D. E. DONY MACHINERY CO.
47 Laureiton Road, Rochester 9, N. Y.

FOR SALE

Pratt & Whitney 14" x 36" Vertical Spindle Ball Bearing Grinder, Model B, Serial #945, motor drive including motor and 11" x 34" magnetic chuck. Excellent condition.

OGDEN R. ADAMS
284-288 State Street Rochester, N. Y.
Tel. Main 6374-5

Your inquiries to advertisers will have special value . . .

—for you—the advertiser—and the publisher, if you mention this publication. Advertisers value highly this evidence of the publication you read. Satisfied advertisers enable the publisher to secure more advertisers and—more advertisers mean more information on more products or better service—more value—to YOU.

IMMEDIATE DELIVERY

"FALK" for DEPENDABILITY in Rebuilt Machinery

BORING MILLS

48" Gisholt Vertical Boring and Turning Mill.
52" Colburn Boring and Turning Mill.
3½" Bar, Landis, Floor Type; Floor Plate 120"x72"; Range—60" Longitudinal Travel, 60" Vertical Travel, 26" Spindle Travel at one Setting.

MILLING MACHINES

No. 8 Cincinnati Vertical High Power Miller, Motor Driven; Power Rapid Traverse, Serial A 808-E; Range 34" Longitudinal Travel, 12" Transverse, 20" Vertical; Thoroughly reconditioned; immediate delivery.
AMES Precision Universal Bench Mill.
#2-B Plain Kearney & Trecker Milwaukee Mill. Motor in base.
No. 1 Kempsmith Universal Mill
No. 4 Brown & Sharpe high power plain Miller, single pulley drive
No. 1 Cleveland Vertical Miller.
No. 2 Pratt & Whitney Duplex Production Miller, Belt drive and countershaft.
No. 1 U. S. Hand Miller, motor driven.
No. 12 Pratt & Whitney Profiler.
No. 1½ Valley City Plain Miller, belt drive.
PRATT & WHITNEY 2" Spline Duplex Miller
1—No. 4 Cincinnati Plain Miller, high power, Serial #A-709-D.

HEAVY PRODUCTION FOLDER NIAGARA #98

6' x 14 gauge capacity. Ar. M.D.
Working length 72", cap. 14 gauge; min. width of fold at cap. 1" gaging range (narrow folds) ¾" to 1⅝", max. gaging range 72" left of chamfering bar 3". Shipping wt. 12,690 lbs. Like new.

HAMMERS

High Speed Riveting Hammers, all sizes in stock from 6 A to AA 1.
1100 lb. Niles Steam Forging Hammer.
50 lb. Fairbanks Blacksmith Forging.
15 lb. Bradley upright strap Hammer.

GRINDERS

#4 Gallmeyer & Livingston Universal Tool and Cutter Grinder. Motor Drive with Wet Attachment.
#2 Cincinnati Centerless Grinder
24" x 136" Landis Universal Cylindrical Grinder, motor drive, perfect condition, rare bargain.
Pratt & Whitney 14" x 36" Vertical Surface Grinder, ball bearing spindles, belted motor drive, 10" x 36" magnetic chuck.
No. 2 and No. 3 Brown & Sharpe Cutter Grinder.
#2 Brown & Sharpe Universal Cylindrical, belt drive.
18" Gordon Disc Grinder, double end, B.D.
12" x 2" New B-line Floor Grinders, 3 H.P., 3-60-220/440.
24" Landis Universal Cylindrical Grinder (as illustrated foot of next column).
Marschke 24" x 3" Swing Frame Grinder.

GEAR CUTTING MACHINERY

No. 13 Brown & Sharpe Spur & Bevel Gear Cutter.
No. 612 Fellows Gear Shapers, large hole in spindle. Exceptionally fine condition.
#6 Fellows Gear Shaper, belt drive, Serial #4221.

PLANERS

POND 72" x 72" x 18' table; 2 heads on rail, 2 side heads.
CINCINNATI 30" x 30" x 10' table, M.D.
PUTNAM 48" x 48" x 12' table, M.D.
Gray 26" x 26" x 8' Double Housing Planer, single head on cross rail, belted motor drive.
Cincinnati 24" x 24" x 6' table, belt drive, single graduated swivel head on cross rail.
American, 30" x 30" x 12', A.C. Motor Drive, two heads.
Betts Planer, 120" between uprights, 72" under rail, 35' table. Equipped with four heads and arranged direct motor drive with D.C. 50 H.P. reversing type motor and controller. Perfect condition. Immediate delivery.

120" x 3/16" NIAGARA SHEAR

Niagara Model 10E 10'x3/16" Power Shear. 18" gap. Frame arranged for Motor Drive. Prompt Delivery. Shipment from Cincinnati.

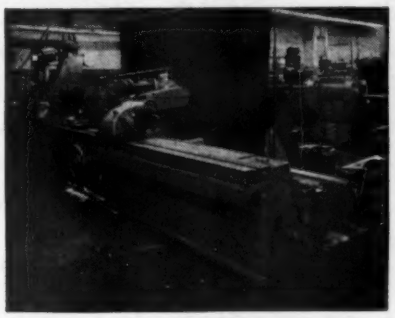
#4 Waterbury Belt Trimmer. Capacity ¾"x 8" with Hopper Feed and Motor Drive.

DAVENPORT AUTOMATIC SCREW MACHINE

Model B High Speed. 5 Spindle 9/16 round capacity. With Threading Attachment.

LANDIS UNIVERSAL CYLINDRICAL GRINDER

Size 24" swing x 136" between centers. Motorized, motors, 3 phase 60 cycle 220-440 Volt. Complete with Tank and Pump. Warranted in first class mechanical condition. Will hold long work to very close tolerances. BARGAIN PRICE. Immediate delivery.



LATHES

LeBlond 21 x 10 Quick Change Gear Lathe, motorized.
Rockford 16 x 6 Quick Change Gear, motorized.
LeBlond 14" x 6' Toolroom Quick Change Gear Screw Cutting Lathe with taper attachment, drawbar collets and two chucks.
American 16 x 8 Quick Change Gear, motor drive.
Seneca Falls 14 x 6 Quick Change Gear, motor drive, taper attachment, collets.
Reed-Prentice 20" x 10' Quick Change Gear, motor drive, taper attachment.
Logan Model #450 Turret Lathe, new, ⅝ capacity, immediate delivery.
26" x 12' PUTNAM Heavy Duty, Quick Change Gears, fitted with Raising Blocks to swing 32"; Arranged for direct Geared Motor Drive.
22" x 16' REED "Light Pattern" Plain Change Screw Cutting Lathe, fitted with 12" 4-jaw chuck, standard equipment. $550.00.
21" x 16' LeBlond, Heavy Duty Quick Change Gear Screw Cutting Lathe, Motorized 3-60-220, Oil Pan, Taper Attachment, Pump, Chuck and Standard Equipment, Rebuilt, Immediate Delivery.
21" x 8' LeBlond Heavy Duty Geared Head motor driven Screw Cutting, Quick Change Gear, Engine Lathe, with taper attachment, 18" 4-jaw Independent Chuck, standard equipment. Motor Dr.
Monarch 16" x 8' Quick Change Gear Bowl Head, 3 step cone, double back geared with two chucks, taper attachment, standard equipment.
16" x 6' South Bend Plain Change Lathe, 4-step cone, belt drive, standard equipment.
Fitchburg, LoSwing Lathes 8" x 108". Late type.
10' x 42" Logan New Lathes. $225.00.
18" x 10' bed Rahn-Carpenter Plain Change Gear Screw Cutting Lathe. Fitted with 12" 4-jaw Independent chuck, recently reconditioned. PRICE: $850.00. Shipment from Worcester, Mass.

Buy From Stock

FALK MACHINERY MACHINERY CO.,

18 WARD ST.

MERCHANTS

Tel. Main 6347-6348

ROCHESTER 5, N.Y.

KEEP 'EM RUNNING!

Every machine listed in this column is in our warehouse at press time.

●

4½ Bar, N.B.P. Horizontal Boring Mill, Knee Type, 30"x90" table, M.D.
#0 FOSDICK Horizontal Boring, Drilling & Milling Machine, M.D.
ROCKFORD Horizontal Drilling & Boring Machine 3⅜" spindle
4' HAMMOND Hi-Speed Sensitive Radial Drill, M.D.
33" x 9" GOULD & EBERHARDT Spur Gear Cutter
3' WESTERN Plain Radial Drill
7' AMERICAN Universal Radial Drill, M.D.
15" GLEASON Bevel Gear Generator
14"x5' PRENTICE Portable G. H. Lathe
42" PUTNAM Double End Car Wheel Lathe, M.D.
#1 N.B.P. Car Wheel Lathe
#3-B MILWAUKEE Plain Miller
#2 CLEVELAND Plain Miller
#10 NILES Vertical Milling Machines
#6 BECKER Vertical Milling Machine
30"x30"x10' NEWTON Slab Miller
12" Wm. SELLERS Slotters
20" SELLERS Crank Slotter, M.D.
12"x12" ACME Power Hack Saw, M.D.
48"x48"x24' N.B.P. Heavy Planer, Two Rail, One Side Head, M.D.
48"x48"x20' PATCH Planer, 4 heads, 230 volt D.C. Rev. M.D.
24"x24"x8' WHITCOMB Planer, 230 volt D.C. Reversing M.D.
#3 WARNER-SWASEY Turret Lathes, 3⅛" bar capacity
#1 L&A Multiple Punch, 100 Tons, 72" between housings
6"x6⅝" SOUTHWARK Double Angle Shear
SCHULTZ - NAUMANN Beam Shear, 20", 60 lb. and smaller
60" Throat, 8" x 1 1/16 LONG & ALSTATTER Shear
54" Throat 1¾"x1⅛" HILLES & JONES Punch
42" Throat, 1¾"x1" HILLES & JONES Punch, M.D.
4" LANDIS Pipe Threading Machine
6" BIGNALL - KEELER Duplex Pipe Machine
10" STANDARD Pipe Threading Machine
4" BAKER Heavy Duty Automatic Tapping Machine
#0 BAKER Keyseater, M.D.

SIMMONS ENGINEERED REBUILDING

SIMMONS MACHINE TOOL CORP.
1759 North Broadway, Albany 1, N. Y.
N. Y. Office: 149 Broadway

MOREY
Dependable Used Machines

BULLARD 24" R.P. Vert. Turret Lathe
N.B.P. 96"x98"x16' Planer; 4 heads; DC variable M.D.; box table
N.B.P. 48"x36"x14' Planer; 3 heads; box table; belt drive
GRAY 24"x24"x6' Single Head Planer
GRAY 72"x48"x12' Planer — two heads; belt drive
HAMILTON 42"x42"x20' Planer; 3 heads; DC motor drive
LUCAS #3, 3½" bar Horiz. Boring Mill — Belted M.D.
D.&H. 5" bar Horiz. Boring Mill
D.&H. 3½" Bar Horiz. Boring Mill
N.B.P. 38-44" Vert. Boring Mill; side head
TAYLOR & FENN 6" Spline Miller; M.D.
CINCINNATI #2 Vert. Miller, M.D.
LEES BRADNER #6 Thread Miller
K.&T. #2B, #3B Plain Millers
CINCINNATI BICKFORD 4' & 6' Plain Radial Drills; M.D.
AMERICAN 3' Radial Drill — motor on arm, triple purpose
NATCO C-13 Hyd. Multiple Drill
NORTON 12x72" Plain Grinder
NORTON 15"x15"x72" Openside Surface Grinder
LANDIS 20"x220" Plain Grinder;
LANDIS #3½ Int. Hydraulic Race Grinder
DIAMOND #4 Surface Grinder; Hyd. Feeds
HEALD #60 Internal Grinder; M.D.
GLEASON 6"-18" Bevel Gear Generators
BROWN & SHARPE #3H Gear Cutter
ESPEN LUCAS No. 138 Cold Saw — Cap. 12"
SAUNDERS 8"-18" Pipe Threader
TREADWELL 12" Pipe Machine
GISHOLT Precision Balancer
LONG & ALLSTATTER Double Angle Shears
100 Ton Horiz. Hydraulic Forcing Press
CINCINNATI Gear Burnisher; M.D.
GOULD & EBERHARDT 24" Shaper —motor drive
LYND FARQUHAR 26" Planer Type Shaper

THIS IS A PARTIAL LIST
Send us your specific inquiries

MOREY MACHINERY CO., Inc.
410 BROOME ST., NEW YORK

. . . IN STOCK

AUTOMATICS
No. 00G Brown & Sharpe, single spindle
No. 00 Brown & Sharpe, single spindle
⅞" Model M Cleveland, four spindle
⅞" Model G Gridley, four spindle
5½" Cleveland Model A, single spindle

BORING MILLS
148" Betts Vertical, 2 heads
84" Gisholt Vertical, 2 heads
4" Fosdick Horizontal, Floor Type

BROACHES
XB 10 Oilgear Hydraulic, Horizontal
Hercules 15 Ton Press Broach

DRILLS
3' Cannedy-Otto Radial, Motor spindle
4' American Radial, s.p.d.
24" Colburn, single spindle
Barnes Camelback, single spindle, tapping
No. 310 Baker, single spindle
No. 17 Foote-Burt, 2 spindle
Leland-Gifford, Sensitive, P.F., 3 spindle
Barnes Camelback, 4 spindle, 2 tapping
No. 11 Natco, multiple spindle
No. 13 Natco, multiple spindle

GEAR CUTTERS
No. 6 Fellows Gear Shaper
30" x 10" Maag Gear Shaper
No. 3 Brown & Sharpe Automatic
96" Gleason Gear Planer
15" Gleason Spiral Bevel Generator
No. 10 Lees-Bradner Gear Grinder
30" Rochester Gear Tooth Rounder

GRINDERS
22" x 48" Pratt & Whitney Vertical Spindle Surface, Timken Bearing
No. 2 Wilmarth & Marmon Surface
30" Diamond Face, 84" Table Travel
No. 3 Landis Universal
10 x 36 Norton Cylindrical
No. 1½ Cincinnati Universal Tool & Cutter
No. 70 Heald Internal

LATHES
14" x 6' Monarch, c.d.
18" x 15' Schumaker, Boye & Emmes, c.d.
20" x 8' Greaves & Klusman, c.d.
8" x 60" Fitchburg Lo-Swing, g.h.
20" x 12' Lodge & Davis, c.d.

TURRET LATHES
24" Bullard New Era Vertical, m.d.
36" Bullard New Era Vertical, m.d.
12" Bullard Mult-Au-Matic, six spindle, m.d.
2A Warner & Swasey, g.h.
No. 4 Warner & Swasey, c.d.
1B Foster
2¼" x 24" Jones & Lamson, g.h.
16" Libby Universal, g.h.
26" Libby Universal, g.h., 7½" hole

MILLS
No. 2 Rockford, g.h.
No. 13B Brown & Sharpe, g.h.
No. 2 Oesterlein, c.d.
No. 12 Brown & Sharpe, c.d.
Briggs Type B, c.d.
No. 3 Kempsmith Vertical Maximiller, m.d.
No. 3 Brown & Sharpe Vertical, s.p.d.
Model C Becker Vertical, s.p.d.
4" Pratt & Whitney Spline

MISCELLANEOUS
16" Betts Slotter
100 Lb. Bradley Helve Hammer
Pratt & Whitney Design Profiler
No. P2 Ferracute Press
13" x 13" Peerless Universal Saw

PLANERS
24" x 24" x 8' American, m.d.
38" x 38" x 12' Niles, m.d.
72" x 56" x 20' Cincinnati Hypro, m.d.
96" x 96" x 25' Detrick & Harvey Openside, m.d.

Write, wire or phone us

INDIANAPOLIS MACHINERY & SUPPLY CO., INC.
1959-1969 South Meridian Street
INDIANAPOLIS 6, INDIANA
Eastern Branch:
44 WHITEHALL STREET, NEW YORK, N. Y.

HILL-CLARKE
Modernized
CYLINDRICAL GRINDERS *for* SUPER-GRINDING *and* MICRO-FINISH

SIZES AVAILABLE

10x28	10x50	14x72	16x72
10x36	14x50	16x50	18x96
			18x168

Hill-Clarke Modernized and Motorized Cylindrical Grinders offer refinements in design which minimize vibration and assure extreme accuracy on all grinding operations. One of these refinements, the Hill-Clarke Patented Multiple V-Belt Drive to work spindle, contributes to the smoothness in operation which makes possible a finish whithin a few micro-inches even when using standard grain free-cutting wheels.

Send for a copy of our catalog "Super Grinding."

HILL-CLARKE MACHINERY CO. CHICAGO U.S.A.

Have you any NORTON grinders you wish modernized and motorized?

HILL-CLARKE MACHINERY CO.

651 WASHINGTON BOULEVARD **CHICAGO 6, ILL.**

SELECTIONS FROM MILES' STOCK

Automatic, 7" Baird 6 spindle
Automatic, 4½" Gridley Model H 4 spindle
Automatic, 1¾" National Acme 4 spindle
Automatic, 1¾" New Britain 6 spindle
Automatic, 1¼" x 10" Fay
Boring Mill, 3" bar, No. 3-A Universal
Boring Mill, 3⅛" Beaman & Smith cylinder
Brake, 10' x 10 ga. Dreis & Krump leaf
Broach, No. 3 double & No. 4 Lapointe
Compressor, 427 Cu. Ft. Chicago steam
Compressor, 550 Cu. Ft. National, elec.
Compressor, 1400 Cu. Ft. Sullivan, elec.
Drill, Multiple, Nos. 11, 13 & 18 Natco
Drill, Sensitive, 30" Henry & Wright No. 3
Drill, Radial, 3' American heavy duty
Drill, Sensitive, Nos. 1 & 2 Avey, 1 & 2 spdl.
Gear Shaper No. 21 Fellows (large hole)
Gear Hobber, No. 16 HS Gould & Eberhardt
Gear Hobber, No. 1 Lees Bradner
Gear Hobber, No. 2 Barber Colman
Gear Cutter, 26", & 42 Brown & Sharpe
Gear Lapper, 8" Red Ring
Gear Generator, 18" Gleason bevel gear and bevel pinion
Gear Tester & Lapper, 18" Gleason
Gear Chamferer, No. 4 Pearless
Grinder, 12' x 48" Cincinnati No. 3 Univ.
Grinder, 22", No. 84 Gardner opposed disc
Grinder, 20' Gardner semi-auto. disc
Grinder, No. 72 Heald electric indicator automatic internal
Grinder, Nos. 50 & 60 Heald cylinder
Grinder, 24' Cincinnati milling cutter
Grinder, 16" x 48" Landis crankshaft
Grinder, No. 2 Cincinnati centerless
Grinder, 12" x 36", 16" x 36" & 16 x 52 Landis
Grinder, 10" x 30", No. 10 Brown & Sharpe
Lathe, 18" x 8' Greaves Klusman QCG
Lathe, 36" x 16' Putnam grd hd, QCG
Lathe, 8" Sundstrand stub
Lathe, 1" x 18" Pratt & Whitney automatic
Lathe, 14" Porter Cable
Lathe, Turret, 22" Libby, 4⅛" hole
Lathe, Turret, 26" Libby, 4⅛" hole
Lathe, Turret, 26" Libby, 7⅛" hole
Lathe, Turret, No. 3B Foster, 5⅛" hole
Lathe, Turret, Nos. 4 & 6 Warner & Swasey
Lathe, Engine, 14" x 6' Hendey
Miller, No. 8 Van Norman duplex
Miller, 30" Newton continuous rotary
Miller, Nos. 10 & 45 Productomatic
Miller, No. 2 Turnmillers
Miller, 48" Oesterlein tilted offset
Miller, No. 1 Davis Thompson Duplex
Miller, No. 3 Cincinnati high power
Miller, No. 3 Reed Prentice vertical
Planer, 24" x 24" x 5' Gray
Planer, 36" x 36" x 16' Cleveland openside
Press, No. 53 Toledo straight side
Press, 150 ton V.K. & V. coining
Press, No. 79614-D Toledo Dbl. Cr. toggle
Press, 28", No. 71 Swaine double crank
Press, No. 174 Consolidated gap double crank, roll feed
Press, No. 33 Consolidated arch frame
Press, No. 2 Standard screw type
Press, 8 ton No. 82 General Flexible
Press, 51", No. SG54 Ferracute double crank
Roll, No. 1 Ajax forging
Roll, No. H60 Yoder crown fender
Saw, Cold, 4", 7" & 8" Higley
Saw, Cold, 36" Newton
Shaper, 16" Milwaukee
Shaper, 36" Morton draw cut
Shear, 8" x 8" x 1" L. & A. double angle
Shear, 1½" Lewis alligator
Slotter, 4" Garvin
Swager, No. 6 HS Langeller
Upsetter, 4" Ajax, suspended slides
Welder, 275 KVA Fisher Body press
Welder, butt, 80 KVA Taylor Winfield B8

SEND FOR COMPLETE STOCK LIST

MILES MACHINERY CO., SAGINAW, MICH.

LATHES
24" x 12' Niles Heavy Duty, Q.C.

GRINDERS
Fitchburg Spline Shaft Grinder.
Lees Bradner Gear Grinder.
Simplicity Piston Grinder.

GEAR MACHINERY
18" Gleason Bevel Gear Generators.
6" Bilgram Bevel Gear Generator.
#4—36" B & S Automatic Gear Cutter.
Lees Bradner Gear Grinder.
#6 Fellows Gear Shaper, Cone.

PLANERS
42" x 42" x 20' Cincinnati Hypro 4 Heads, D.C. drive.
72" x 60" x 28' Pond 2 heads, Belt drive.
24" x 24" x 6' Gray Planer.
26" x 26" x 8' Woodward & Powell, 2 Hds.
48" x 48" x 26' American Planer 4 Hds.

RADIAL DRILLS
2½' American Plain, M.D.
3' American Sensitive.
3' American Plain.
3' Cincinnati Bickford Plain Radial Drill.
5' Cincinnati Bickford M.D.
4 spindle Sipp, Power Feeds.

MISCELLANEOUS
14" Niles Slotter.
1500# Bell Steam Hammer.
#4 Cincinnati Vert. High Power Mill, M.D.
#2B Brown & Sharpe Plain Miller, S.P.D.

CINCINNATI MACHINERY & SUPPLY CO.
217 East Second St., Cincinnati, Ohio

NEW HAVEN 30" x 22' Heavy Duty, Triple Geared, Internal Geared Faceplate Drive ENGINE LATHE, A.C. Motor Drive.
NILES-BEMENT-POND Horizontal Boring, Drilling & Milling Machine, 4½" bar, Duplex Control, Table Type, with Auxiliary Table, M.D.

ALSO MANY OTHER TOOLS

ALEX ZEEVE & COMPANY
2200 Woolworth Building New York, N. Y.

Ingersoll 36" x 36" x 8' Planer type miller with vert. hd. & 2 side hds. D.M. driven Yoder 20 stand roll former suitable for aircraft section work.

NATIONAL MACHINERY EXCHANGE
134-138 Mott St., New York, N. Y.

Before you buy, sell or exchange machinery of any kind contact us first.

PAUL'S MOTOR & MACHINERY SUPPLY
6111 Vermont Ave.
DETROIT, MICH.

EASTERN REBUILT MACHINE TOOLS

For Immediate Shipment

No Priority Required

MILLING MACHINES

No. 2 Cincinnati Plain High Speed Dial Type, m.d. in base
No. 2 Cincinnati Vertical High Speed Dial Type, m.d. in base
No. 2 Cincinnati Plain High Power, m.d.
No. 2 Heavy Kearney & Trecker Plain, m.d. in base
No. 3B Brown & Sharpe Plain High Speed, m.d.
No. 3 Brown & Sharpe Plain, cone
No. 3B Milwaukee Plain, double overarm, m.d.
No. 3 Cincinnati Vertical, m.d.
No. 4K Kearney & Trecker Plain, m.d. in base
No. 4 Cincinnati Plain rect. overarm
No. 4 Cincinnati Plain, round overarm
No. 4B Milwaukee Plain, m.d.
No. 4 Cincinnati Universal, cone
No. 5B Heavy Brown & Sharpe Plain, m.d.
No. 5 Cincinnati Plain, rect. overarm, m.d.
No. 1 Tight Vertical, cone
No. 2 Knight Vertical, m.d.
No. 4 Knight Vertical, m.d.
No. 5 Jackson Vertical, m.d.
No. 6 Becker Vertical, cone
Becker Lincoln Type, cone
Newton Keyseat, m.d.
4½ x 12" Pratt & Whitney Thread, m.d.
6 x 14" Pratt & Whitney Thread, belt
6 x 48" Pratt & Whitney Thread, m.d.
6 x 80" Pratt & Whitney Thread, m.d.
18" Cincinnati Mfg., belt
28" Cincinnati Plain Auto., spd.
36" x 36" x 14' Bement Slab Miller, m.d.
54" x 54" x 10' Liberty Planer Type Miller, m.d.
Carter & Hakes Mfg., Cone
No. 2 Pratt & Whitney Lincoln Type, cone
No. 12 Pratt & Whitney Lincoln Type, cone
Burr Mfg., m.d.

PIPE MACHINES

2" Bignall, cone
2" Brown, cone
4" Eaton, Cole & Burnham, cone
3" Jarecki, cone
4" Curtis, cone
4" Merrell, cone
6" Columbus, Cone
6" Landis, m.d.
10" Cox, m.d.

SLOTTERS

10" Bement
10" Newton
12" Niles
15" Canada
15" Niles
48" Niles-Bement-Pond Geared Slotter, reversing m.d.
No. 1, 3 Acme Screw Slotters

TAPPERS

No. 1 Garvin Knee Type
No. 3 Webster & Perks 3 spindle Nut
½" Rickert & Shaffer
No. 3 Gaterman Oscillating Pneumatic

WELDERS

200 amp. General Electric Arc, driven by Pontiac Engine
250 amp. Wilson Arc driven by Oldsmobile Engine

MISCELLANEOUS

Gisholt Precision Balancing, m.d.
27 x 11" Abbott Burnishing Barrel
4" Hurlburt & Rogers Cut-off Machine
Anderson Filing Machine, m.d.
No. 2 Cochran-Bly Filing Machine
No. 5A Frankfort Gas Fired Oven & Hardening Furnace
No. 1 Stewart Blast Furnace, oven type
Detrick & Harvey 2 spindle Profiler
No. 12 Pratt & Whitney 2 spindle Profiler
No. 11 Cochran-Bly Saw Sharpener
Wagner Saw Sharpener
No. 1 Leighton Type Straightening Machine, m.d.
17 x 21" Lentz Poppet Valve Steam Engine direct connected to Allis-Chalmers Generator, 200 KVA, 200 RPM, 240 volts, 60 cycles
No. 1½A Standard Rotary Swaging Machine, cap. ⅛" tube, ¼" solid

We carry an average stock of 1,000 machines. Send us your inquiries.

The EASTERN MACHINERY CO.
1004 TENNESSEE AVE.
CINCINNATI, OHIO

72" x 48" x 24' Gray Planer—two hds. on rail reversing motor drive

3" bar Universal Horizontal Boring Machine

36" x 36" x 8' Cincinnati Planer—one head — arranged constant speed motor drive

18" Libby Turret Lathe—3½" hole

4-spindle Henry & Wright Ball Bearing Drills (11)

24" x 36" x 10' Ingersoll Horizontal Spindle Slab Milling Machine

24" x 24" x 14' Ingersoll Adjustable Rail Miller one vertical head

32" x 37½ x 12' Ingersoll Adjustable Rail Miller two vertical heads

HILL-CLARKE MACHINERY COMPANY

Chicago 6, Illinois

651 Washington Boulevard

4' Universal Radial Drill, B.D.
26" x 14' Bridgeford Geared Head Lathe
#14 Cochrane-Bly Vert. Miller & Shaper, M.D.
12" x 32" Landis Universal Grinder
24" Gisholt Turret Lathe, 6¼.
20"-24"-32" Shapers.
10' Bridgeport Knife Grinder.
36" Morton Draw Cut Shaper.
No. 2 Mitts & Merrill Keyseater 12" x 1¼".

West Penn Machinery Company
1210 House Bldg. Pittsburgh, Pa.

USED COLLETS

FEED FINGERS PADS

1⅛" C Acme
Acme to #56
Brown & Sharpe
Bardons & Oliver
Cleveland
Cone Automatic
Davenport
Foster
Gridley
New Britain
Warner & Swasey

For Quick Sale

1½" Geometric Rotary Die Head

. . . phone, wire, write for quick service and guaranteed satisfaction. Immediate shipment from one of America's biggest stocks.

Graff **MACHINE TOOL CO.**
7140 S. HALSTED ST.
All Phones Vincennes 9664
CHICAGO (21) U. S. A.

GEAR MACHINERY

9" Pratt & Whitney Gear Grinder, M.D.
11" Gleason Bevel Gear Generator
No. 64 Fellows Gear Shaper, M.D.
No. 6 Fellows Gear Shaper
Cimatool Gear Chamfering M.D.
Lees-Bradner Gear Grinder

LATHE — TURRET LATHES

6" x 6¾" Goss & DeLeeuw Chucking Machine
3" x 36" Jones & Lamson Turret Lathe, bar feed
25"-50" x 12' LeBlond Gap Lathe, Sliding Bed, Geared Head, Motor Drive

SHAPERS — PLANERS

16"-Walcott Shaper, Back Geared, Cone Drive
36" x 36" x 8' Woodward & Powell Planer, Rev. M.D.
36" x 48" x 12' Cinc. Hypro Planer, 4 Hds.
18" x 18" x 4' Whitcomb Planer

MILLING MACHINES

4¼ x 12" Pratt & Whitney Thread Millers (2)
3-A—3" Bar Universal, Hor. Bor. Mill.
3-B K & T Plain Miller
6" x 48" Pratt & Whitney Thread Miller

GRINDERS

10" x 120 Norton Grinder, M.D.
#10 Brown & Sharpe Pl. Grinder, M.D.
No. 91-A Covel Cutter & Tool Grinder
No. 3 Oesterlein Cutter & Tool Grinder

MISCELLANEOUS

21-SA Cochrane-Bly H.S. Saw
No. 171 Bliss Stiles Sprue Cutter
12" Lamb & Nash Type K Slitter
New Delta Drilling Equipment

WIGGLESWORTH MACHINERY CO.
203 Bent St., Cambridge, Mass.

BORING MILLS

10', 60" Niles Vert.
3½" Rochester Floor, M.D.
4", 4½" Gisholt and Niles Horiz.
54", 60" Colburn Vert., M.D.
36" Niles, Bausch
36" Bullard V.T.L., M.D.
42" Bullard, M.D.
2½" Binsee, Universal, M.D.
3" Rockford Horiz., M.D.

CANAL MACHINERY COMPANY
176 LAFAYETTE STREET, NEW YORK, N.Y.

MISCELLANEOUS MACHINES

48"x36"x16' Gray Dbl. Housing Planer, 3 hds., 15 HP, A.C. m.d.
3" bar Morris Horiz. Boring Mill with 4 boring bars, m.d.
3' Carlton Sensi. Radial Drill, #3MT hole
6' Niles Pl. Radial Drill, gear box m.d., 15 HP motor, rebuilt
12"x18" Cinci. Plunge Cut Grinder, m.d. accommodates wheels up to 9" face, rebuilt
Gisholt Tool Grinder, m.d.

STRONG, CARLISLE & HAMMOND CO.
1392 West 3rd St., Cleveland, Ohio — 2832 East Grand Blvd., Detroit, Michigan

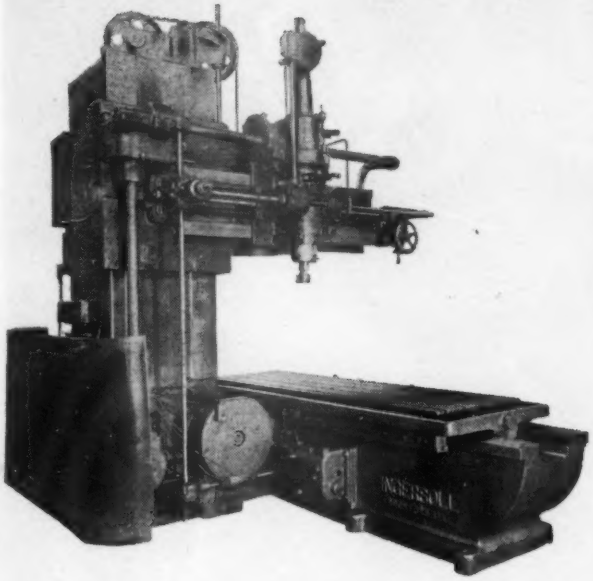
---

UNUSUAL VALUES

Bolt Cutter 1" capacity, 3 spindle
Brake Robinson 5' toggle
Compressor, 120 Schramm, portable
Drill, new 10" Buffalo bench
Drill, ceiling suspended, unlimited drilling area
Drill Press, 20" three spindle Barnes
Drill, six-spindle Henry & Wright, 12" overhang
Drill, two spindle sensitive, #1 Morse taper
Grinder, #20 Bryant deep hole internal
Grinder, 60" plate
Grinder, Sellers Tool
Hammer, 50# Bradley upright helve
Kelley, 16" back geared shaper
Lathe, 24"x 18' Sleptoe-McFarlan
Pipe Machine, 6" Merrell
Press, #8-7 Zah-Hahnemann straight side grd.
Press, #1 open back inclinable, motor drive.
Punch & Shear, two ⅛" capacity
Threading Machine, #0 Webster & Perks
Turret Lathe, L & D brass, cross slide turret
Vacuum Cleaners, heavy duty for shop use

THE OSBORNE & SEXTON MACHINERY CO.
COLUMBUS, OHIO

INGERSOLL OPEN SIDE VERTICAL MILLER



30" x 48" x 96" INGERSOLL OPEN SIDE VERTICAL MILLING MACHINE

Table working surface 29" x 96".
Spindle vertical feed 24".
Table travel 96".
Maximum distance spindle to column 44".
Adjustable rail.
Power rapid traverse.
Arr for motor drive.
Weight about 24,000 lbs.

IMMEDIATE DELIVERY

This machine is available for inspection at any time.

Wire — Write — Phone

EMERMAN MACHINERY CORP.

875 W. 120th STREET **CHICAGO, 43, ILLINOIS**

IMPORTANT LIQUIDATION

MOST OF THE EQUIPMENT AT

E. J. MANVILLE MACHINE CO. INC.
HAMILTON AVENUE AND EAST MAIN STREET *WATERBURY, CONN.*

Avail Yourselves of These "Buys"

N.B.P. 38"-44" Vertical Turret Lathe
BULLARD 60" Vertical Boring Mill
N.B.P. 96" x 90" x 15' Planer; 4 heads; box table; variable speed M.D.
GRAY 60" x 60" x 14' Planer; 3 heads
Niles-Bement-Pond 48" x 36" x 14' Planer; 3 heads
GRAY 24" x 24" x 6' Planer; 1 head
Kearney & Trecker No. 2B & No. 3B Plain Millers
TAYLOR & FENN Spline Miller, M.D.
CINCINNATI BICKFORD 6' Pl. Radial Drills
HENDEY 18" x 8' & 20" x 8' Engine Lathes
BRADFORD 42" x 16' Engine Lathe
NORTON 15" x 15" x 72" Surface Grinder; M.D.
NORTON 14" x 72" Plain Grinder
CINCINNATI No. 1½ Universal Grinder
LUCAS No. 3" & 3½" bar Horiz. Boring Mills; M.D.
BROWN & SHAPE #3H Gear Cutter

CRANES—from 5 to 20 ton capacity
TOOLROOM EQUIPMENT—such as Drills, Reamers, Milling Cutters, etc.
RAW MATERIALS—Steel, Lumber and many other items

Partial List—50 Other Machine Tools Available. Investigate—Ask for details.

OTT MACHINERY SPECIALS

AUTOMATICS, Acme, Model C—9/16" M.D.
AUTOMATICS, Gridley, 9/16" & ⅝" Model G
AUTOMATICS, Gridley, 2¼, 4¼ & 5¼" S.S.
AUTOMATICS, Cleveland, 1¼, 1½, 3, 3¾ & 3¾"
AUTOMATICS, Cleveland, ⅝, 1¼ & 2½" Mod. B
AUTOMATICS, Cleveland, 1¾ & 1½" Model M
AUTOMATICS, Cleveland, 3½" Model K4
AUTOMATICS, New Britain #33 M.D.
AUTOMATICS, Potter & Johnson #8A & 6A
GEAR HOBBERS, #5A Lees Bradner, M.D.
GEAR HOBBERS, #5 Barber-Colman
GEAR SHAPERS, #7 High Speed, M.D.
GRINDER, Blanchard #16 A.B. 5, 30" x 18" Magnetic Chuck, M.D.
LATHE, Steinle Turret, 24 x 4½ & 6¼ @ M.D.
LATHES, Warner & Swasey #2A & 3A, M.D.
MILLING MACHINES, Becker Vertical, Model S. D. 40" Rotary Table
MILLING MACHINE, Milwaukee, #3 B Plain, M.D.
PRESSES, O. B. I. Herring, etc.

OTT MACHINERY SALES, INC.
542 Second Ave. Detroit 26, Mich.

HYDRAULICS

1—W-F 1000 ton press, 20" ram, 7" stroke
1—Elmes 1¼ x 4" Horiz. 4 plunger pump, 6½ GPM, 5000# W.P.
1—Triplex Pump 1 x 5, 1000 cu. in., 6000# W.P.
2—Horiz. 4 pl., 60 GPM, 2000#
2—Triplex 200 GPM, 500#
2—Triplex 24 GPM, 2500#
1—Accumulator 10" x 12', 2500#
1—Accumulator 15" x 11', 450#
1—150 Ton C Frame Steam Hydraulic Forging Press

AARON MACHINERY CO.
45 CROSBY STREET NEW YORK, N.Y.

SHEET METAL MACHINERY

NEW and USED—Hand and Power Brakes, Shears, Forming Rolls, Folders, Punches, Rotary Machines, Stakes, Spot and Arc Welders.

B. D. BROOKS, INC.
361 Atlantic Ave., Boston, Mass.

POWER PRESSES

BLISS, TOLEDO, V & O, ETC.
HERCULES GUARANTEED

JOSEPH HYMAN & SONS
Tioga, Livingston and Almond Streets
Philadelphia, Pa.

BACK THE ATTACK—BUY MORE WAR BONDS

★ ★ ★ What is responsible for the deadly accuracy of America's fire power—why are our soldiers the best marksmen in the world? Is it training—practice—aptitude? Each of these is a contributing factor, of course—but most important is the accuracy, the absolute precision, with which rifles, machine guns and cannon are made.

These "shooting stars" are a few of the parts—from a variety of guns—formed, hardened and ground in great volume by the craftsmen of Allied Products Corporation who use specialized equipment perfected over the years. The value of our *specialized experience*, on this and other wartime assignments, can be gaged by the high percentage of Allied parts which pass every inspection test.

"IT'S AN ALLIED PRODUCT!"... Allied Products Corporation and its divisions, Richard Brothers and Victor-Peninsular, in Detroit and Hillsdale, Michigan, also make: The original, patented R-B Interchangeable Punch and Die; sheet metal dies; plastic molds; jigs and fixtures; cold forged parts; and other special products.

ALLIED PRODUCTS
CORPORATION

Executive Offices: 4646 Lawton Ave., Detroit 8, Mich.

All four plants have now added a star to their Army-Navy "E" pennants

ADVERTISERS INDEX

Abrasive Machine Tool Co. 228
Ace Manufacturing Corp. 180
Acme Machine Tool Co. 58
Acme Pattern & Tool Co. 148
Acromark Co. 270
Adams Company 188
Aerco Corp. 245
Allen Mfg. Co. 181
Allen-Bradley Co. Insert between 204-205
Allied Products Corp. 282
Allis-Chalmers Mfg. Company 77
Almond Mfg. Co., T. R. 262
Aluminum Co. of America 43
American Brake Shoe Co. 159
American Brass Co. Insert between 172, 173
American Broach & Machine Co. 54
American Chain & Cable Co., Inc. 222, 263
American Laundry Machinery Co. 268
American Metal Hose Branch of The American Brass Co. 213
American Screw Co. 150, 160
American Tool Works Co. 52, 53
Ampco Metal, Inc. 206
Ampco Twist Drill Co. 124
Apex Machine & Tool Co. 135
Armstrong-Blum Mfg. Co. 78
Armstrong Bros. Tool Co. 38
Atkins & Co., E. C. 227
Atlas Press Co. 217
Automotive Maintenance Machinery Co. 175
Avey Drilling Machine Co. 270

Bakewell Mfg. Co. 80, 176
Baker Bros., Inc. 271
Baldwin Southwark Div., Baldwin Locomotive Works 137
Ball & Roller Bearing Co. 181
Barber-Colman Co. 20
Bardons & Oliver, Inc. 48
Barrett Co., Leon J. 214
Baumbach Mfg. Co., E. A. 194
Behr-Manning Corp. 246
Bethlehem Steel Co. 250
Bilgram Gear & Machine Works 188
Blake Co., Edward 218
Blanchard Machine Co. 41
Blount Co., J. G. 234
Boots Aircraft Nut Corp. 182
Braun Gear Co. 188
Bridgeport Machines, Inc. 212
Bridgeport Safety Emery Wheel Co. 224
Bristol Co. 150
Brown & Sharpe Mfg. Co. 71
Bryant Chucking Grinder Co. 49
Bryant Machinery & Engineering Co. 36
Buhr Machine Tool Co. 234
Bullard Company 29
Burke Machine Tool Co. 216
Buss Machine Works 231

Cadillac Gage Co. 34
Campbell, Andrew C., Div. American Chain & Cable Co., Inc. 222
Carboloy Co., Inc. 269
Carborundum Co. 247
Card Mfg. Co., S. W. 258
Carlton Machine Tool Co. 224
Central Screw Co. 150
Chandler Products Corp. 150
Cincinnati Bickford Tool Co. 79
Cincinnati Electrical Tool Co. 204
Cincinnati Gear Co. 190
Cincinnati Grinders, Incorporated 10, 11
Cincinnati Lathe & Tool Co. 228
Cincinnati Milling Machine Co. 4, 5
Cincinnati Planer Co. 44
Clearing Machine Corp. 191
Cleveland Crane & Engineering Co. 195
Cleveland Hobbing Machine Co. 133
Cleveland Twist Drill Co. 239
Colonial Broach Co. 131
Cone Automatic Machine Co., Inc. 37
Consolidated Machine Tool Corp. 229
Continental Screw Corp. 150
Corbin Screw Corp. 150
Coulter Machine Co., James 212
Covel Mfg. Co. 32
Crafts Co., Inc., Arthur A. 266
Cunningham Co., M. E. 260
Curtis Pneumatic Machinery Co. 264
Cushman Chuck Co. 201

Dalzen Tool & Mfg. Co. 233
Danly Machine Specialties, Inc. 198
Davis Keyseater Co. 216
Dayton Rogers Mfg. Co. 266
Dearborn Gage Co. 143
Deepfreeze Div. Motor Products Corp. 225
Desmond-Stephen Mfg. Co. 266
Detroit Bevel Gear Co. 188
DeVlieg Machine Co. 76
DeWalt Products Corp. 240
Diamond Tool Co. 272
Dykem Company 258

Earle Gear & Machine Co. 189
Eastern Machine Screw Corp. 70
Electric Auto-Lite Co. 153
Elmes Engrg. Works of American Steel Foundries 193
Empire Tool Co. 259
Errington Mechanical Laboratory 266
Etna Machine Co. 192
Ettco Tool Co. 256

Famco Machine Co. 194
Fawick Airflex Co. 249
Fellows Gear Shaper Co. 8, 9
Fidelity Chemical Products Corp. 256
Firth-Sterling Steel Co. 66, 67
Fitchburg Grinding Machine Corp. 33
Fitzsimons Co. 152
Fosdick Machine Tool Co. 46

Gallmeyer & Livingston Co. 222
Ganschow Gear Co. 188
Gear Specialties Mfgrs. 186
General Electric Co. 55, 210, 211
General Engineering & Mfg. Co. 220
General Machinery Corp. (Ohio) 28
General Screw Mfg. Co. 150
Geometric Tool Co. 272
Gisholt Machine Co. 17
Gleason Works 3
Gorham Tool Co. 173
Gorton Machine Co., George 177
Goss & deLeeuw Machine Co. 203
Graham Mfg. Co. 272
Grant Gear Works 186
Grant Mfg. & Machine Co. 194
Gray Co., G. A. 42
Greenfield Tap & Die Corp. 235
Grobet File Co. 272

Hall Planetary Co. 203
Hamilton Tool Co. 216
Hardinge Brothers, Inc. 39
Harnischfeger Corp. 232
Harper Co., H. M. 150
Hartford Special Machinery Co. 189, 190
Haskins Co., R. G. 254
Heald Machine Co. 2nd Cover
Hobart Brothers Co. 270
Hoefer Mfg. Co. 214
Holman Reamer Co. 272
Honan Crane Corp. 273
Hones, Inc., Charles A. 270
Hovis Screwlock Co. 197
Hyatt Bearings Div. of General Motors Corp. 174

Ingersoll Milling Machine Co. 21
International Screw Co. 150

James Mfg. Co., D. O. 184, 185
Jefferson Machine Tool Co. 196
Johnson Machine Co., Carlyle 178
Jones & Lamson Machine Co. 6, 7

Kearney & Trecker Corp. 31
Kempsmith Machine Co. 59
Kennametal, Inc. 35
Kent-Owens Machine Co. 209
Kingsbury Machine Tool Co. 45
Knight Machinery Co., W. B. 236
Kobe, Incorporated 253
Kropp Forge Co. 172
Kux Machine Co. 198

Lamson & Sessions Co. 150, 164, 165
Landis Machine Co. 14, 15
Landis Tool Co. 18, 19
LaPointe Machine Tool Co. 255
Leach Machinery Co., H. 230, 241
LeBlonde Machine Tool Co., R. K. 61
Lee Co., K. O. 220
Leland Gifford Co. 228
LeMaire Tool & Mfg. Co. 188
Lempco Products Co. 26
Lima Electric Motor Co. 166
Lincoln Electric Co. 72, 73
Link Belt Co. 179
Linley Bros. Co. 222
Lodge & Shipley Machine Tool Co. 127
Logan Engineering Co. 199
Lucas Machine Tool Co., Inc. 230
Luers, J. Milton 270
Lynn Mfg. Co. 258

ADVERTISERS INDEX

Machinery Mfg. Co. 224
Magnus Chemical Co. 238
Marlin Rockwell Corp. 167
Master Electric Co. 231
Mattison Machine Works 74
McCaskey Register Co. 149
McCrosky Tool Corp. 141
McGraw-Hill Book Co., Inc. 204, 206, 252
Mechanite Research Institute 155
Meisel Press Mfg. Co. 190
Metal Carbides Corp. 262
Metro Tool & Gage Co. 63
Micromatic Hone Corp. 56, 57
Mid-West Abrasive Co. 30
Milford Rivet & Machine Co. 150
Millholland Machinery Co., W. K. 230
Mitts & Merrill 230
Modern Tool Works 229
Monarch Machine Tool Co. 24, 25
Monarch Steel Co. 152
Morey Machinery Co., Inc. 228
Morris Machine Tool Co. 82
Morse Chain Co. 170
Morse Twist Drill & Machine Co. 219

National Acme Co. 243
National Machine Tool Co. 258
National Screw & Mfg. Co. 150
National Twist Drill and Tool Co. 261
Newark Gear Cutting Machine Co. 190
New Britain-Gridley Machine Div., Britain Machine Co. 3rd Cover
New England Screw Co. 150
Nichols-Morris Co. 161
Nicholson & Co., W. H. 268
Nilson Machine Co., A. H. 198
Noble & Westbrook Mfg. Co. 218
Norton Co. 22, 23
Nilson Machine Co., A. H. 198

Oakite Products, Inc. 266
Oliver Instrument Co. 196
O'Neil, Irwin Mfg. Co. 196
Ozalid Products Division General Aniline & Film Corp. 65

Parker Co., Charles 150
Parker-Kalon Corp. 150
Pawtucket Screw Co. 150
Perfection Tool & Metals Heat Treating Co. 273
Pheoll Mfg. Co. 150
Philadelphia Gear Works, Inc. 183
Phillips Screw Mfrs. 150
Phoenix Gage Co. 270
Pioneer Engineer & Mfg. Co. 180
Plomb Tool Co. 260
Portage Machine Co. 220
Potter & Johnston Machine Co. 47
Pratt & Whitney Div. Niles-Bement-Pond Co. 40
Production Machine Co. 204
Producto Machine Co. 230

Quaker Chemical Products Corp 16
Quaker City Gear Works, Inc. 186
Quality Tool & Die Co. 267
Queen City Machine Tool Co. 248

Randall & Stickney 268
Reading Screw Co. 150
Ready Tool Co. 262
Reed-Prentice Corp. 68, 69
Reed Small Tool Works 260
Refiners Lubricating Co. 252
Republic Steel Corp. 156, 157
Revere Copper & Brass, Inc. 139
Rockford Machine Tool Co. 196
Russell, Burdsell & Ward Bolt & Nut Co. 150
Ruthman Machinery Co. 178
Ryerson & Son, Inc., Jos. T. 142

S.K.F. Industries, Inc. 154
Schatz Mfg. Co. 171
Scherr Co., George 50
Schultz & Anderson Co. 242
Scovill Manufacturing Co. 150
Sellers & Co., Wm. 169
Shakeproof, Inc. 150
Sheldon Machine Co., Inc. 218
Shore Instrument & Mfg. Co., Inc. 262
Sier-Bath Gear Co., Inc. 187
Smit & Sons, J. K. 158
Smith & Mills Co. 228
Socony Vacuum Oil Co., Inc. Insert between 236, 237
South Bend Lathe Works 62
Southington Hardware Mfg. Co. 150
Springfield Machine Tool Co. 230
Stahl Gear & Machine Co. 190
Standard Conveyor Co. 147
Standard Pressed Steel Co. 151
Standard Tool Co. Insert between 268-269
Steelweld Machy. Div., Cleveland Crane & Engrg. Co. 195
Sterling Grinding Wheel Division 223
Stevens, Inc., John B. 272
Stokerunit Corp. 221
Strong, Carlisle & Hammond Co. 178
Stuart Oil Co., D. A. 260
Sturgis Products Co. 168
Sundstrand Machine Tool Co. 215
Sun Oil Co. 60
Super Tool Co. 254

Threadwell Tap & Die Co. 237
Timken Roller Bearing Co. (Steel & Tubes Div.) 51, 4th Cover
Tomkins Johnson Co. 251
Tool Improvements Co. 273
Torrington Co. 129, 194
Trabon Engineering Co. 162
Turner Gauge Grinding Co. 144
Tuthill Pump Co. 181

Union Drawn Steel Div. Republic Steel Corp. 156, 157
Union Twist Drill Co. 64
Universal Boring Machine Co. 224
Universal Engineering Co. 268

V & O Press Co. 194
Van Keuren Co. 75
Van Norman Co. 12, 13
Vascoloy-Ramet Corp. 272
Vickers, Inc. 145
Vitrified Wheel Co. 231

Wade Tool Co. 208
Walker Co., Inc., O. S. 265
Walker-Turner Co., Inc. 257
Waltham Machine Works 196
Warner & Swasey Co. 80, 176
Waterbury Steel Ball Co. 158
Waverly Petroleum Products Co. 252
Weatherhead Company 163
Webber Gage Co. 122
Welch Industries, Inc. 264
Weldon Tool Co. 226
Wells Mfg. Co. 207
Westinghouse-Electric & Mfg. Co. 27
Wheelock, Lovejoy & Co., Inc. 158
Wheel Trueing Tool Co. 244
Whitney Screw Corp. 150
Wickman Corp. 202
Wilson Mechanical Inst. Co., Inc. 260
Wood & Spencer Co. 146
Woodworth Co., N. A. 200
Wright Mfg. Div. Amer. Chain & Cable Co., Inc. 263

Yoder Company 205

Zeh & Hahnemann Co. 194

SEARCHLIGHT SECTION

Classified Advertising

Classification	*Page*
BUSINESS OPPORTUNITIES	276
CONTRACT WORK SECTION	274, 275
Bergen Machine & Tool Co., Inc.	275
Bowser, Inc.	274
Eastern Tool & Mfg. Co.	274
General Pattern Works	274
Greist Mfg. Co.	274
J. & S. Tool Co.	274
King Foundries, Inc.	274
Nilson Machine Co., A. H.	274
Precision Motors Co.	274
Reliance Machine & Mfg. Co.	274
Thomas & Skinner Steel Products Co.	274
Vandergrift Co.	274
PATENT ATTORNEY	276
POSITIONS VACANT	276
POSITIONS WANTED	276
REBUILDING SERVICE	278, 279
Hill-Clarke Machy. Co.	279
Simmons Machine Tool Corp.	278
SELLING OPPORTUNITIES	276
WANTED TO PURCHASE	276
USED SURPLUS EQUIPMENT	276-281
Adams, Ogden R.	276
Aaron Machinery Co.	281
Brooks Co., Inc., B. D.	281
Canal Machinery Co.	280
Cincinnati Machinery & Supply Co.	279
DeWitt Tool Co.	276
Dony Machinery Co., D. E.	276
Eastern Machinery Co.	280
Emerman Machinery Corp.	281
Falk Machinery Co.	277
Galbreath Machinery Co.	276
Graff Machine Tool Co.	280
Hill-Clarke Machinery Co.	279, 280
Hyman & Son, Joseph	281
Indianapolis Machinery & Supply Co., Inc.	278
Iron & Steel Products, Inc.	276
Manville Machine Co., Inc., E. J.	281
Miles Machinery Co.	279
Morey Machinery Co., Inc.	278
National Machinery Exchange	276, 279
Osborne & Sexton Machinery Co.	280
Ott Machinery Sales, Inc.	281
Paul's Motor & Mchy. Supply	279
Simmons Machine Tool Corp.	278
Strong, Carlisle & Hammond Co.	280
West Penn Machinery Co.	280
Wigglesworth Machinery Co.	280
Zeeve & Co. Alex	279

Accessibility means More Production!

● One reason why New Britain Automatic Screw Machines are famous for a full day's work, is the fact that they are engineered for accessibility, as well as speed. For instance:

•***TOOL ACCESSIBILITY*** resulting from larger spindle spacing and absence of long oil leads and operating levers.

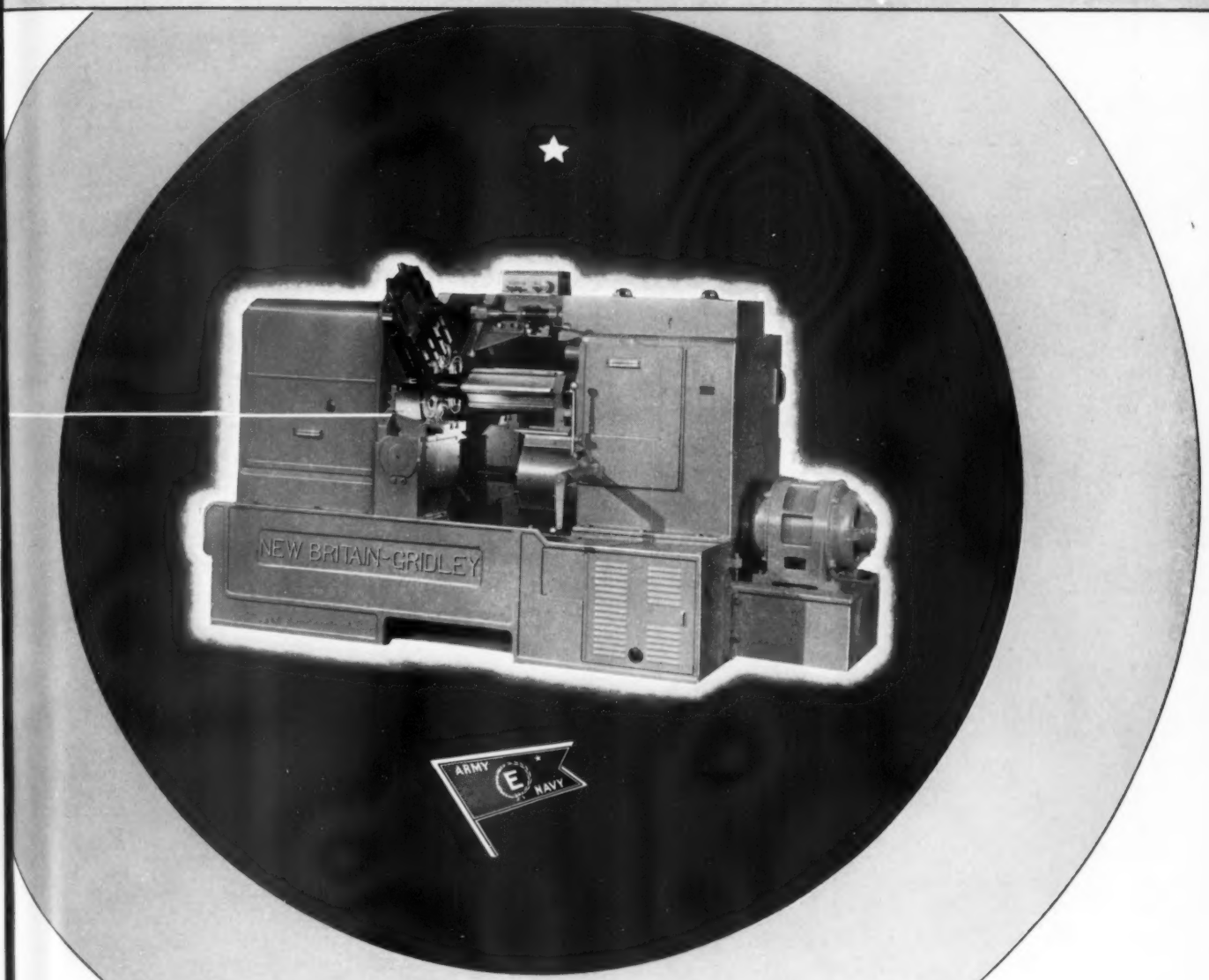
•***STOCK FEED*** cams quickly changeable, tubes readily removable for replacing feed fingers, chucking pressure adjusting collars easily reached.

•***POWER BOX,*** entirely enclosed but with instant access for adjustment to high and low speed clutches.

•***SPEED CHANGE GEARS:*** of pick-off type, quickly reached from drive end of machine.

NEW BRITAIN AUTOMATICS

NEW BRITAIN-GRIDLEY MACHINE DIVISION
THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT



POWER plant units of hard-hitting fighters and bombers contain many vital parts made from Timken Seamless Tubing. This fine product was chosen for these critical applications because it more than meets rigid aircraft standards. The high quality of Timken Tubing is secured by careful control under one closely knit organization from the time the charge is placed into the melting furnaces until the tubes are placed on railway cars for shipment.

Time-saving Timken Tubing eliminates drilling and boring operations, reduces scrap losses, permits speedy operations on automatic screw machines, and often substitutes for forgings. An unbeatable combination that has meant better and faster plane production.

A Timken Engineer will be glad to suggest ways and means of applying the advantages of Timken Seamless Mechanical Tubing to your products. Steel and Tube Division, The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

SEAMLESS STEEL TUBES